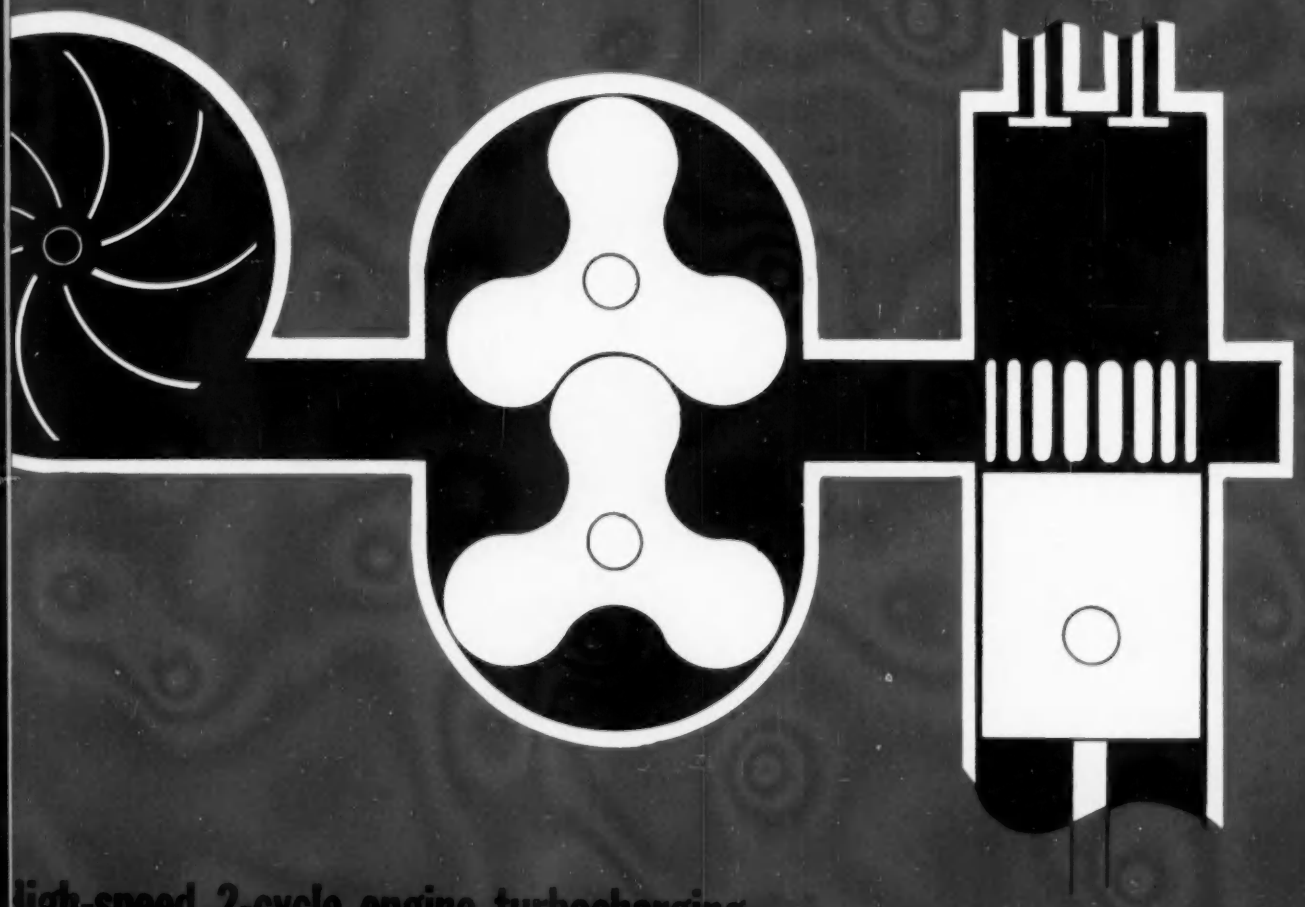
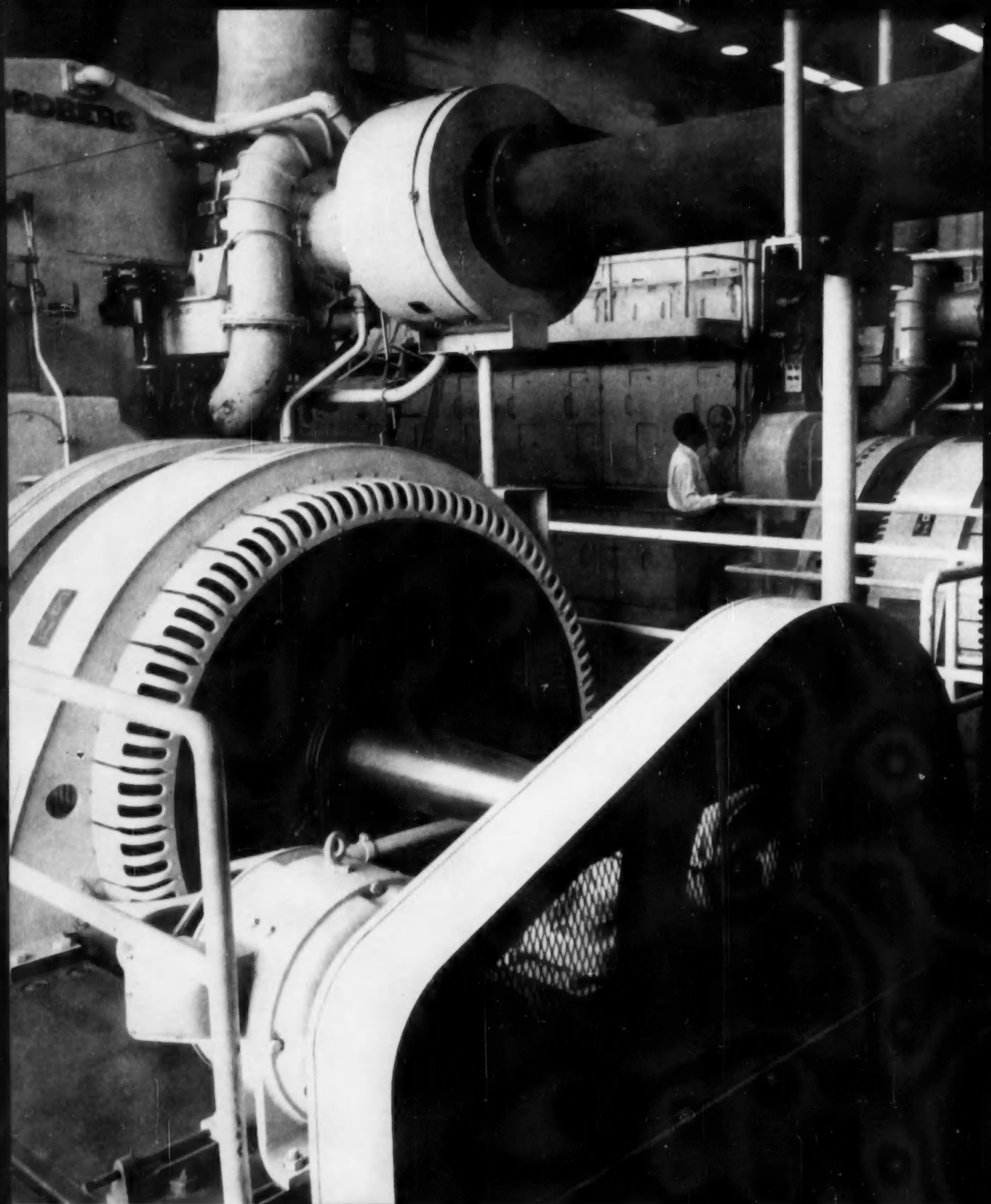
diesel power

June 1956



High-speed 2-cycle engine turbocharging



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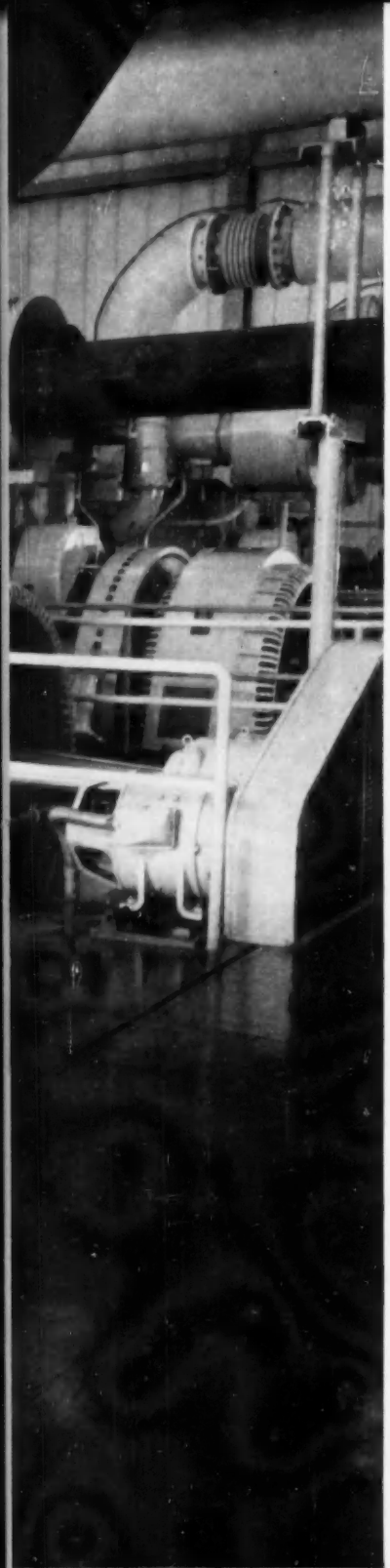


"Overhauls unfailingly show engines clean..."

In this highly efficient diesel plant (name on request) strict maintenance procedures are followed. The four dual-fuel engines shown are lubricated with *Texaco Ursa Oil Heavy Duty* and the Chief Engineer reports:

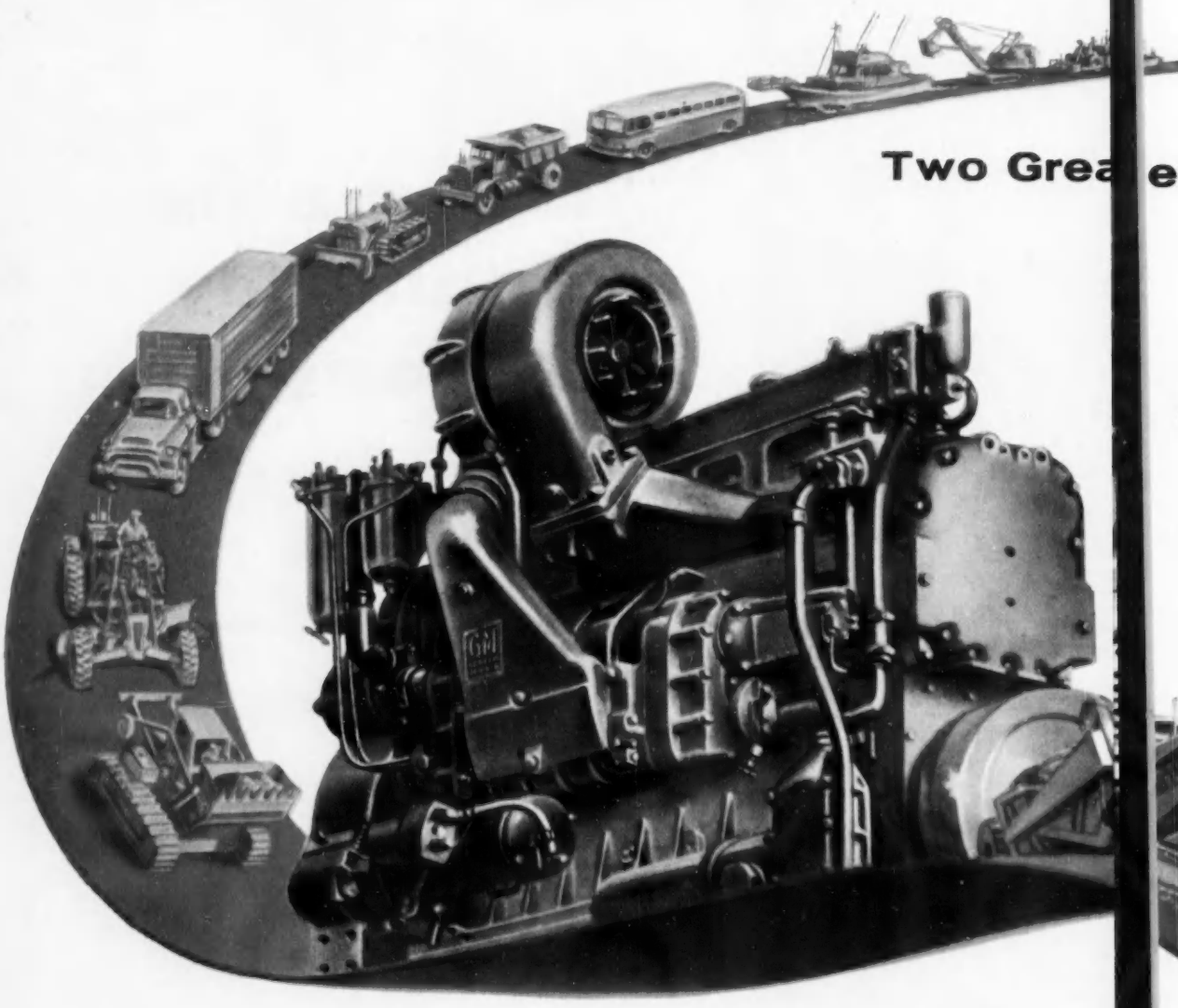
> **"Overhauls unfailingly show engines clean—no deposits and all rings free. Wear is virtually unmeasurable . . . with low maintenance costs and minimum fuel consumption."**

Texaco Ursa Oil Heavy Duty is one of the complete line of famous *Texaco Ursa Oils* especially refined and processed to made diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls. And because these benefits are so consistently delivered, it is a fact that—

> **For over 20 years, more stationary diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.**

A Texaco Lubrication Engineer will gladly help you get maximum efficiency from your diesel operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES



Increased Power—Decreased Fuel

Here's exciting news for power users—great new 4- and 6-cylinder GM Detroit Diesel engines that represent another long forward step by the leader in the Diesel engine field. With this new, more efficient Detroit Diesel Turbopower you can have up to 17% more power with no increase in fuel consumption—or the same power output with fuel saving up to 15%.

Detroit Diesel engineers have Turbo-charged 2-cycle Diesels by combining an exhaust-driven turbine with the engine blower to deliver a larger supply of fresh air to the cylinders. Result: improved combustion, freer engine breathing, quieter and more efficient performance in the higher speed ranges.

Turbopower Diesels are additions to Detroit Diesel's time-proved Series 71 line, world's most widely used Diesel engines. The four-cylinder Turbopower Diesel delivers 171 H.P. at 2300 R.P.M.; the six-cylinder engine produces 280 H.P. at 2300 R.P.M.

To truckers Turbopower means speed-ier, more economical movement of bi payloads.

To boatmen it means faster speed o longer cruising range—more room fo cargo.

To contractors and other industrial user it means greater work output fro higher-powered engines or improve economy.

For the full story of 2-cycle Turbo power, write us or call your neares GM Detroit Diesel Distributor o Dealer.

AMERICA'S LARGEST BUILDER OF DIESEL ENGINES

ew Engines Added

to General Motors 2-cycle Diesel Line

Detroit Diesel Turbopower

Reproduce Factory Precision

with SIOUX

Dual Action Valve Seat Grinders

THE GREATEST possible accuracy can be obtained with the SIOUX Dual-Action Valve Seat Grinder and SIOUX Tapered Pilots. SIOUX Tapered Pilots are precision tools and offer the most positive guide known. The Dual-Action is a controlled fine vibration for grinding and dispersion of the cuttings with the grinding wheel mounted for full contact with the valve seat. It is a perfected system.

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LASTS FROM 10 to 20 TIMES LONGER THAN OLD HEX DRIVE

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diesel power

Established in 1923 **Vol. 34, No. 6** **June, 1956**

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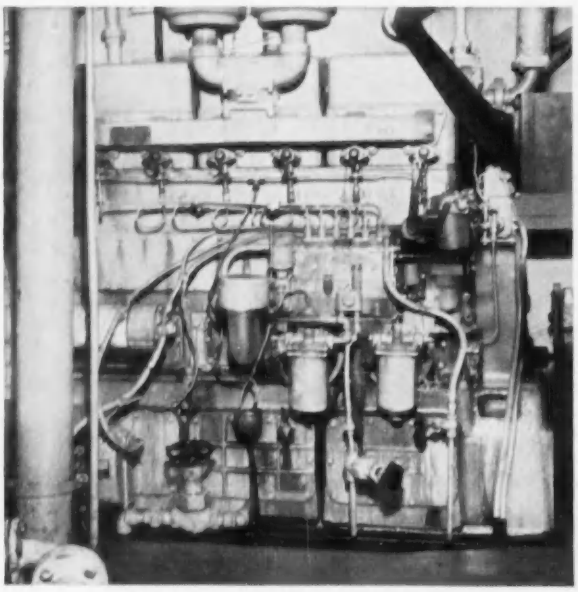
The Engineer's Field Report

CASE HISTORY
LUBRICANT RPM Delo Marine Lubricating Oil
FIRM W.R. Chamberlain Co., Portland, Oregon

Marine generator shows no bearing wear after 6500 hours steady operation



THIS BUDA DIESEL AND THREE OTHER GENERATORS aboard the M/V C-Trader supply power 24 hours a day for all ship's lights. Each unit uses RPM DELO Marine Lubricating Oil—a specially developed lubricant for high-output, low-speed marine diesels. Chief Engineer, Bob Mader (above), took down this 40 kw. Buda after 6500 hours continuous constant-speed operation, found bearings and rings clear, free of lacquer deposits—no noticeable bearing wear.

W. R. CHAMBERLAIN CO. operates the C-Trader as a coastwise lumber vessel between Oregon and Los Angeles. Its main engine, a 1325 h.p. Cooper-Bessemer is also lubricated with RPM DELO Marine Oil—available in all principal ports.

RPM DELO LUBRICATING OILS

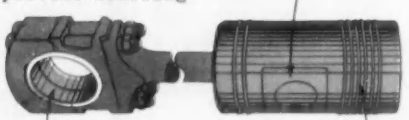
FOR EXPERT HELP, Standard Marine Fuel and Lubricant Engineers in Seattle, Portland, San Francisco and Los Angeles will give ship operators expert help at any time.

FOR INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies below.

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF.

Why RPM DELO Marine Lubricating Oil prevents wear

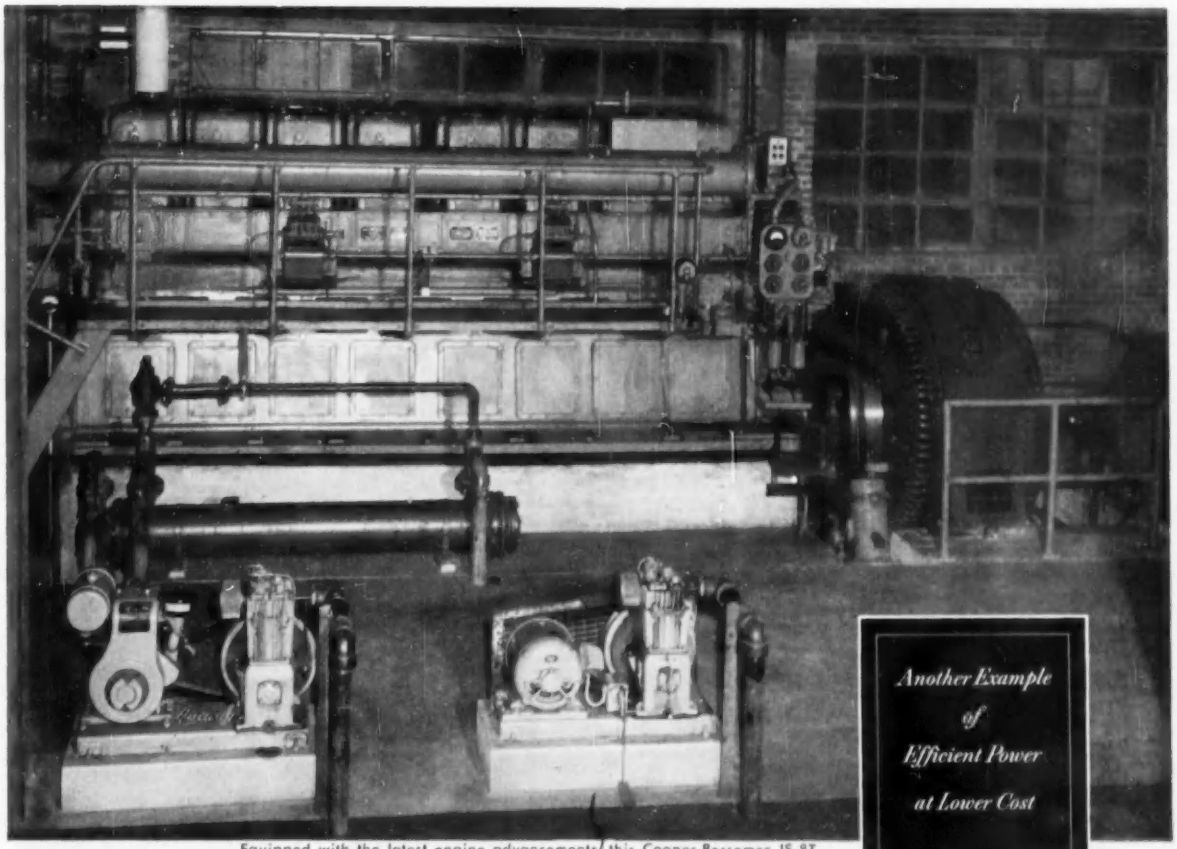
Special inhibitors fight deposits... solve residual fuel problems...help prevent scuffing



Contains anti-oxidant. Film stays on parts whether hot or cold; running or idle

Corrosion and foam inhibitors stop bearing corrosion, prevent foaming in wet or dry sump engines

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado



Equipped with the latest engine advancements this Cooper-Bessemer JS-8T at Breese, Illinois Light and Power, easily develops 1435 bhp at 450 rpm.

Another Example of Efficient Power at Lower Cost

How "Packaged Power" *Pays Breese a BIG Bonus*

THE Cooper-Bessemer stationary generating engine in the Breese, Illinois Municipal Light and Power plant combines several unusual features that really pay off in greatly increased horsepower and unusually high thermal efficiency. To be exact, this 8-cylinder 13" x 16" supercharged JS engine develops 1435 bhp at 450 rpm — a rating out of the question only a few years ago, but now proved conservative.

To produce such horsepower, Cooper-Bessemer added, in addition to supercharging, pre- and after-coolers employing a Vapor Phase Cooling system. Moreover, for still further economy, steam from the engine's cooling water jackets is used to heat boiler feed water for previously installed steam turbines.

And here's a mighty important point . . . in spite of its horsepower, this Cooper-Bessemer unit continues to operate *quietly, smoothly, and with no noticeable surrounding heat.* Proved by performance, this modern JS has now taken over the full load at the Breese Plant . . . and with unprecedented economy.

If your plans call for complex generating and process service, or the most simple arrangement, you'll be money and performance ahead with Cooper-Bessemer. Ask our nearest representative for specific performance figures and estimated savings based on your particular power demands.

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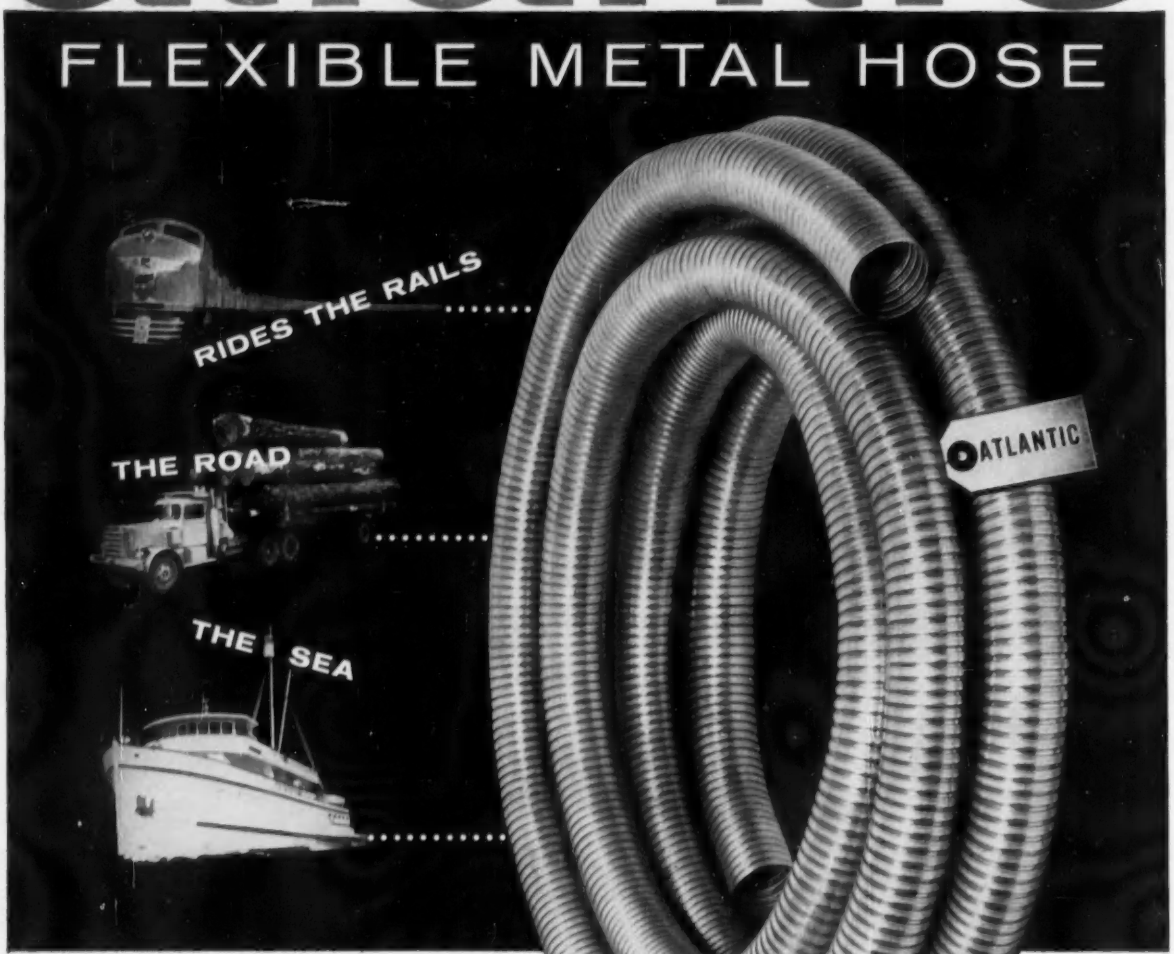
FLEXIBLE METAL HOSE



When diesels power trucks hauling 70,000 lb. loads of logs over mountain roads—or locomotives and ships, Atlantic flexible metal hose is usually given the job of guarding those vital diesel life lines—water, fuel, exhaust.

Atlantic flexible metal hose is manufactured to tough specifications.

Wall thickness is absolutely uniform. Tight against water, oil, steam, gas and air. Requires no maintenance. Atlantic flexible metal hose dampens vibration, remains flexible at higher temperatures.

There is an Atlantic flexible metal hose for each of these applications. Made in bronze, steel, stainless and monel—⅛"-36" I.D. with required fittings.

For misalignment and vibration

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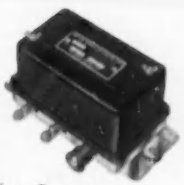
L-N HEAVY DUTY D. C. REGULATORS



Double contact design gives more accurate control over a wider speed range. Tapered charging saves batteries. Oversize, rugged construction for unequalled reliability and long life, with all wearing parts easily serviced and replaced.

Any diesel vehicle or industrial equipment will deliver more reliable performance with less downtime when equipped with Leece-Neville Heavy Duty D.C. units. Since 1909, Leece-Neville has been the pioneer and leader in the design and manufacture of heavy duty automotive electrical equipment, famous for its reliability, long life and top performance. It will pay *you* to specify Leece-Neville. For all the facts write The Leece-Neville Company, Cleveland 3, Ohio. *Distributors in principal cities . . . Service Stations everywhere.*

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High torque for instant break away. Fast cranking speed insures quick start. Ruggedly built for complete dependability. Manual shift or Bendix type drives. Range of sizes for any diesel engine.

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Long life contacts handle high current. Splash-proof construction. Designed for highest reliability.

New magnetic switch (top) fits present mountings. Series parallel switch (below) replaces usual two-switch system.

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D C GENERATORS

CRANKING MOTORS

REGULATORS

SWITCHES

SMALL MOTORS

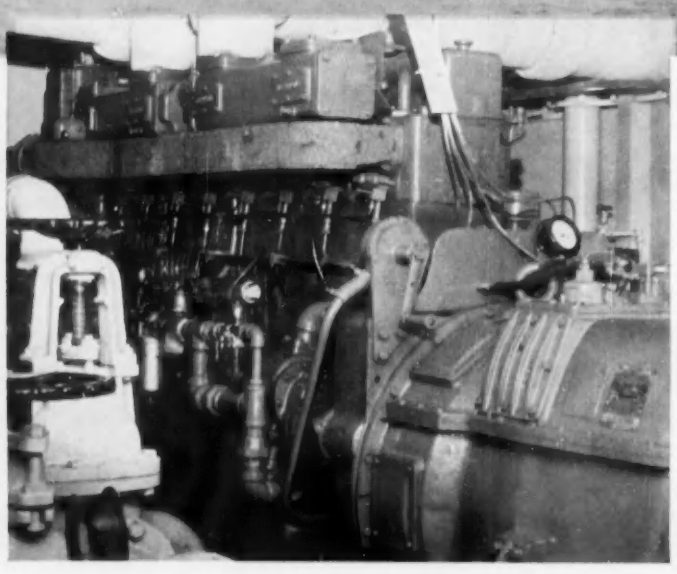
Sea Service, Inc. depends on over 10,000 HP of Allis-Chalmers diesels

to maintain reliable transportation service for the offshore oil industry. They have shown that...

Service is their middle name

Serving the marine oil fields in the open Gulf is a demanding task. Boats and machinery must have the stamina to assure fast, safe delivery of men and supplies around the clock . . . and the power to maneuver accurately in high winds and heavy seas. In building their reputation for excellent service, Sea Service, Inc. has learned to depend on Allis-Chalmers engines. Their

M/V Sea Service is one of six large supply ships in the Sea Service, Inc. fleet. It is 135 ft long, 32 ft wide and is powered by two Allis-Chalmers 516-hp super-charged diesel engines. It carries 600 long tons of deck cargo — mud, cement pipe and other supplies or equipment.



This is one of two 516-hp Allis-Chalmers engines which power the supply ship *Sea Service*. Counting auxiliary engines, the present fleet of Sea Service, Inc. uses over 10,000 hp in Allis-Chalmers diesels.

fleet of six large supply vessels and seven modern crew boats utilize . . .

Over 10,000 HP of Allis-Chalmers diesels

The Allis-Chalmers marine diesels now in Sea Service boats total 8,658 hp in main propulsion engines and 1,510 hp powering generators and auxiliaries — all providing the kind of dependable power essential to this type of service.

This proven dependability and economy is available to you for almost any power requirement. So before you repower or specify any engine in a new boat, ask your Buda Division Marine or Oilfield Dealer for all the facts. Write for free catalogs.

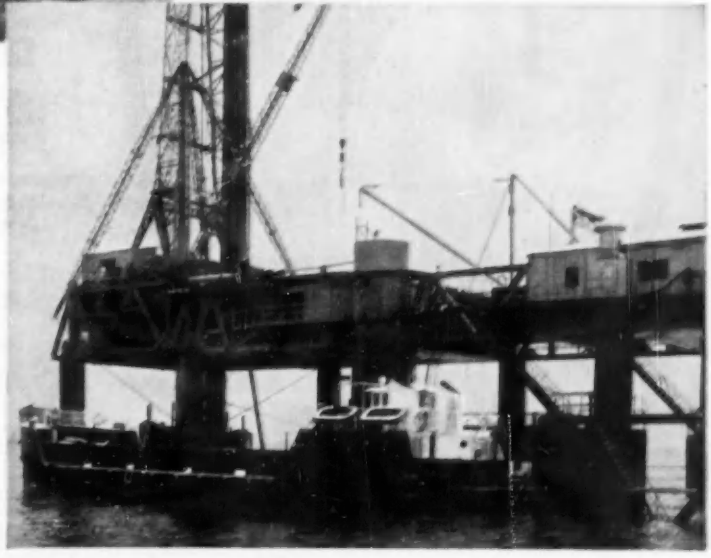
ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

BM-5

The *Gulf Service*, top, and the *Buda Driller*, just above, are two more Sea Service vessels that are familiar to the eyes of offshore oilfield people. The Allis-Chalmers marine diesels on the *Gulf Service* consist of two 2505 main propulsion engines and two 468 generating units, and on the *Buda Driller*, a pair of turbo-charged 1125 main engines and BD77 generating sets.

The 82-ft *Oil Service* is one of seven "outside" crew boats operated by Sea Service, Inc. Powered by two 300-hp Allis-Chalmers continuous-duty engines, it is Coast Guard-certified to carry 31 passengers.



Tying up to "Mr. Charlie" in calm waters like this is duck soup for the utility tender *Pelican Driller*. Like all ships in the Sea Service, Inc. fleet, it has ample reserve power to maneuver quickly along-side offshore rigs in any weather short of a full-scale hurricane. The *Pelican Driller* develops 680 hp with its two Allis-Chalmers supercharged marine engines, and has two Allis-Chalmers auxiliary engines of 114 hp.

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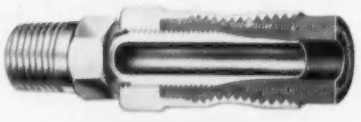

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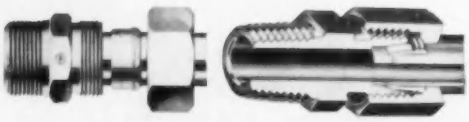

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3-PIECE

2-PIECE

SAE 45° FLARE

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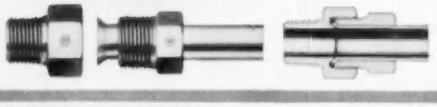

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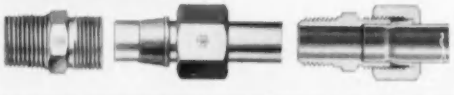
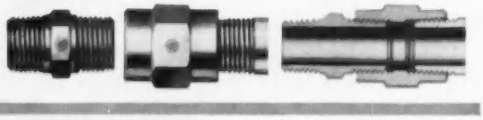
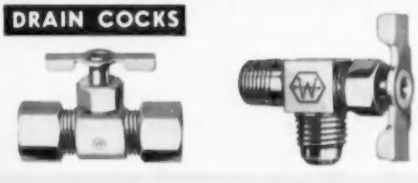


PIPE



DRAIN COCKS



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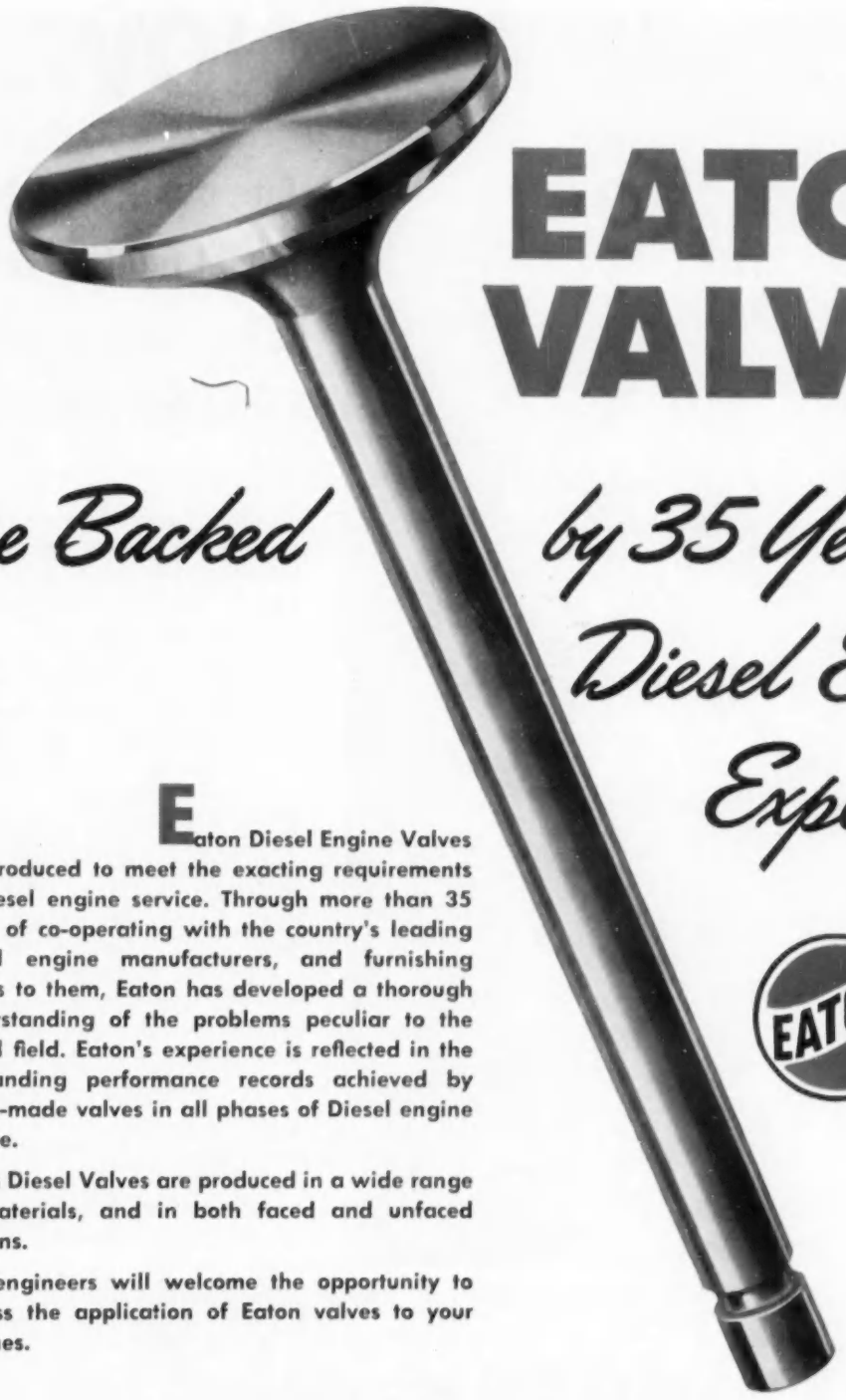

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are Backed by 35 Years of Diesel Engine Experience

Eaton Diesel Engine Valves are produced to meet the exacting requirements of Diesel engine service. Through more than 35 years of co-operating with the country's leading Diesel engine manufacturers, and furnishing valves to them, Eaton has developed a thorough understanding of the problems peculiar to the Diesel field. Eaton's experience is reflected in the outstanding performance records achieved by Eaton-made valves in all phases of Diesel engine service.

Eaton Diesel Valves are produced in a wide range of materials, and in both faced and unfaced designs.

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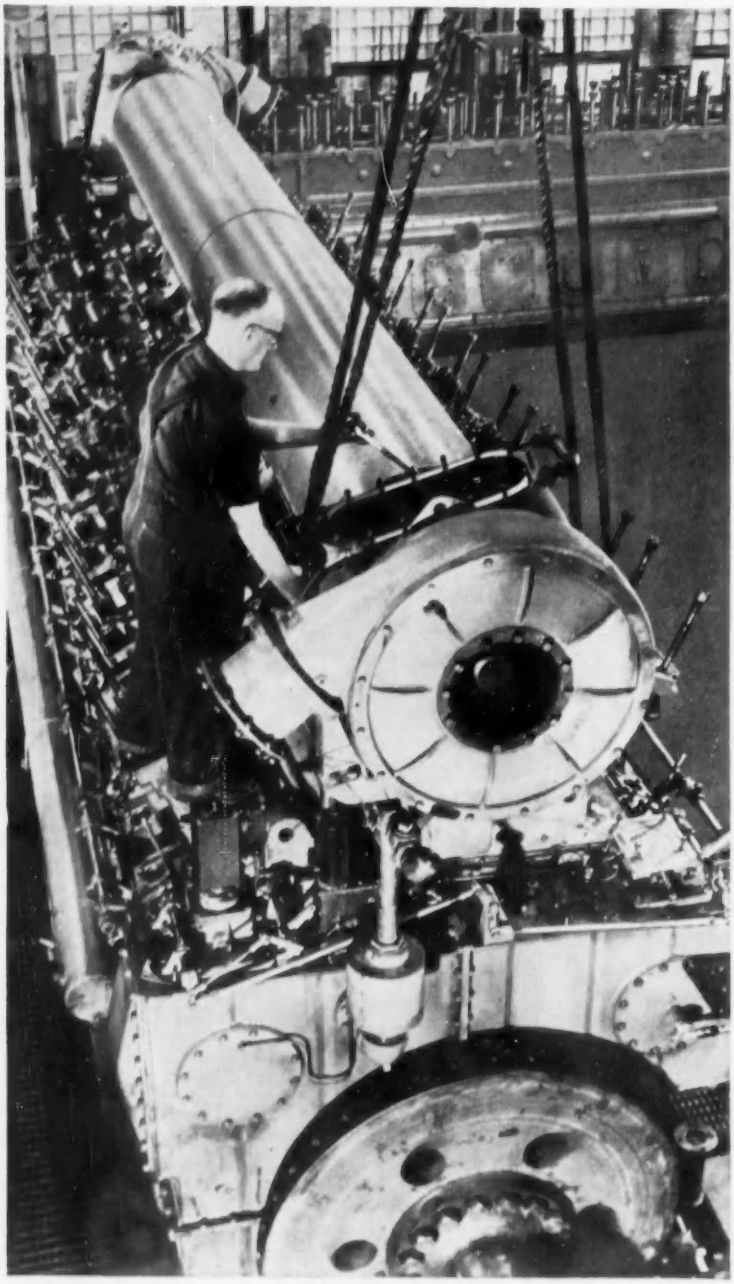

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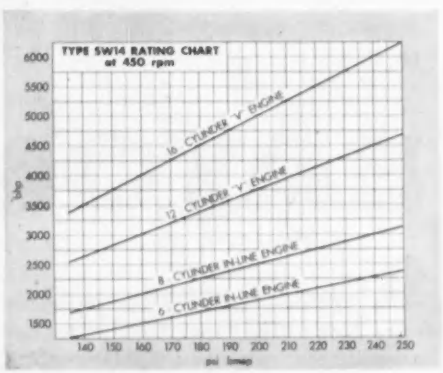
America's first big diesel built to take full advantage of turbocharging

America's first diesel designed and built for turbocharged operation up to 5,000 hp has been hailed as the greatest power engine advance in over twenty years. Fourteen engines on order in its first production year prove unusual user acceptance. Some important reasons for this success are massive component design, compact construction for lower foundation and installation costs, and continuous high power operation on the most economical, locally available fuels.

Worthington's SW 14 offers you performance ratings that are conservative by *any* standard. You can only get this degree of reliability in a turbocharged engine when it's designed specifically for high cylinder pressures under continuous heavy duty operation. A "souped-up" engine just doesn't meet SW 14 standards.

It's as easy as calling your nearest Worthington Office to get the whole story on the SW 14, or write Worthington Corporation, Section E61, Harrison, New Jersey, for Bulletin S-500-B60.

E61



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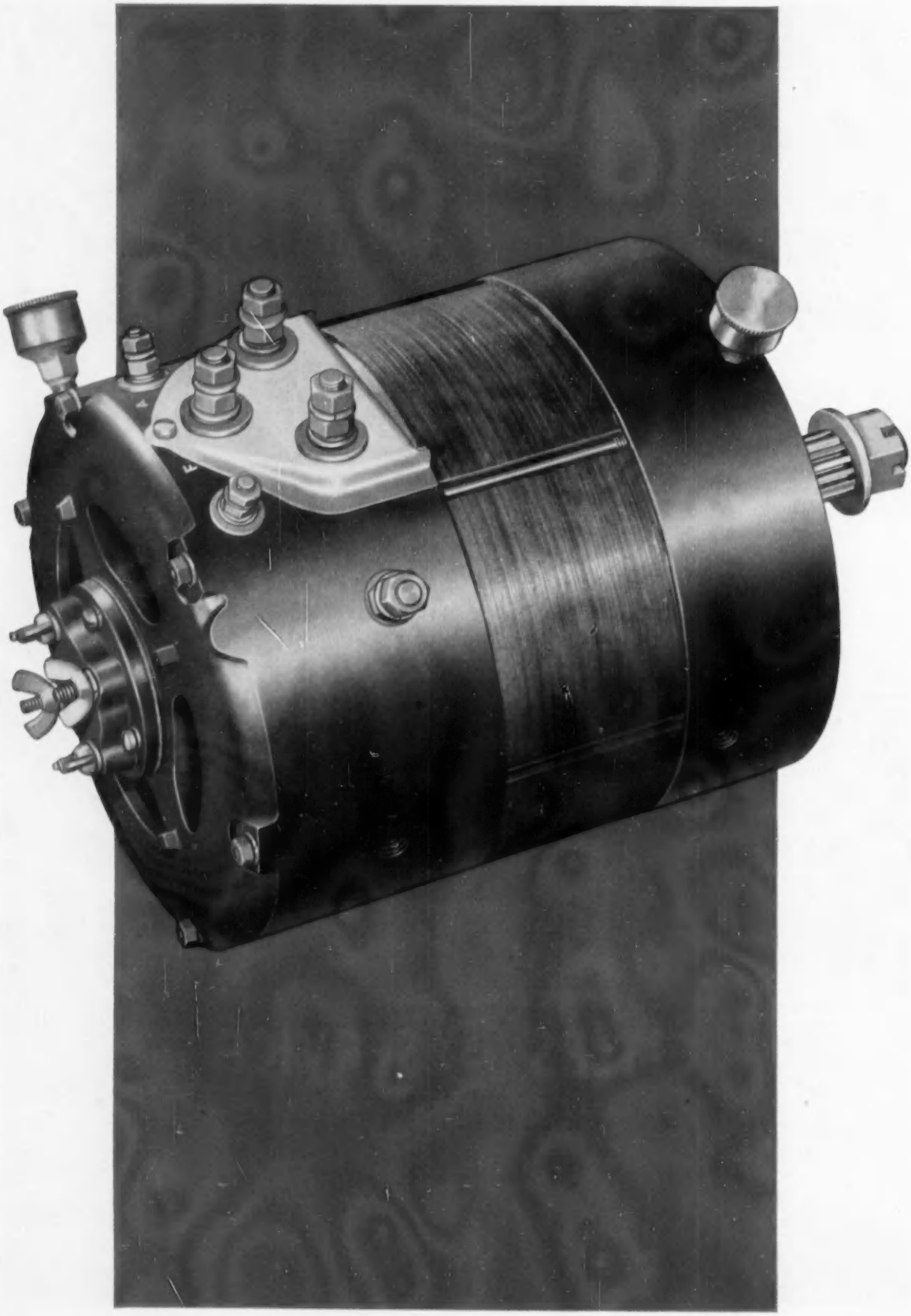
Diesel, Dual-Fuel and Spark-Ignition Engines from 150 to 5000 BHP

"20 Diesels Get Up To 225,000 Miles Before Overhaul With Cities Service C-300 Motor Oil!"

"We don't even have to grind the valves before then," reports Holdcraft Transportation Co., Sioux City, Iowa.



ASK FOR DELCO-REMY MODEL 1117657—THE GENERATOR THAT HANDLES THE TOUGH JOBS—WITH EASE!

This Delco-Remy 12-volt generator—Model 1117657—is the heart of an A.C.-D.C. charging system designed specifically for buses with continuous and extremely heavy electrical loads. It has a low cut-in speed of about 550 rpm, a curb-idle output of 130 amp., and a maximum output of 180 amp. at approximately 2000 rpm. Physically, it is rugged yet extremely low in weight for such a tremendous output. With its matching regulator and rectifier, Model 1117657 will give you all the power a modern bus can use—alternating current for fluorescent lighting, plenty of direct current for other electrical equipment. Specify Delco-Remy A.C.-D.C. charging systems for your buses. They're typical of Delco-Remy leadership in the automotive electrical field.

GM GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY—STARTING WITH

Delco-Remy

ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

on the rails———in the oil fields———in electric-utility service

GENERAL MOTORS 567C 2-Cycle Diesel Engine

6-, 8-, 12- and 16-cylinders, 600 to 1750 H. P.

THE UNMATCHED efficiency and economy of the General Motors 567C 2-cycle Diesel engine—proved in billions of miles of main-line service on railroads—is now being extended to new areas of usefulness.

Through Electro-Motive's long standing engineering policy of making component improvements applicable to earlier models, railroads today are realizing the second step in obtaining maximum economy from dieselization—remanufacture of older Diesel units. Diesels reaching the time for major overhaul can be *remanufactured* and *upgraded* with the 567C engine to today's production standards—at less than half the cost of a new locomotive unit.

The 8-cylinder 567C engine is prime mover in the new Electro-Motive Diesel-Electric Drilling Rig Power Plant which offers the petroleum industry a new concept of lower-cost drilling rig power both on land and offshore.

And new Electro-Mobile Power Units provide electric utilities with a flexible, economical tool for fringe area boosting, peak skimming and emergency use. Built in rail units of 1000 and 750 kw.; truck units of 500 and 350 kw.; and portable units of 1000, 750, 500 and 350 kw. capacities for permanent or semipermanent installations, they serve immediate needs, reduce line costs and help utilities to postpone heavy investments in stationary facilities.

Mass-produced on the long-established lines of Electro-Motive Division's specialized plants, General Motors 567C Diesel engines and engine-generator units cost less than others of comparable capacity. Servicing facilities are nationwide. And the equipment investment is protected by a modernization program that prevents obsolescence.

We invite inquiries of engineers interested in any of the above applications.

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS · LA GRANGE, ILLINOIS

In Canada: GENERAL MOTORS DIESEL LIMITED, *London, Ontario*

SALES OFFICES in New York City, Chicago, Jacksonville, St. Louis and San Francisco

PETROLEUM INDUSTRY SALES OFFICES in Tulsa and Houston

"This piston tells the story of better lubrication with GULF DIESELMOTIVE,"

says Mr. Oscar Voight, Chief Engineer of Baker-Whitely Towing Co., Baltimore, Md.

"I'VE never seen anything like Gulf Dieselmotive oil for tugboat engine lubrication," says Mr. Voight. "When we pulled the pistons of the 'Columbia' after nine years of continuous service, they were barely worn. Rings were free and ports not clogged. Those pistons still had plenty of service left in them."

Gulf Dieselmotive oil has proved time and again in scores of tug fleets that it has the quality to stand up and provide more effective protection for the powerful engines of these hard working boats.

Here's why:

1 Chosen for their ability to prevent hard carbon deposits in hot spots, the selected base stocks of Dieselmotive oil also provide an oxidation resistance safety factor.

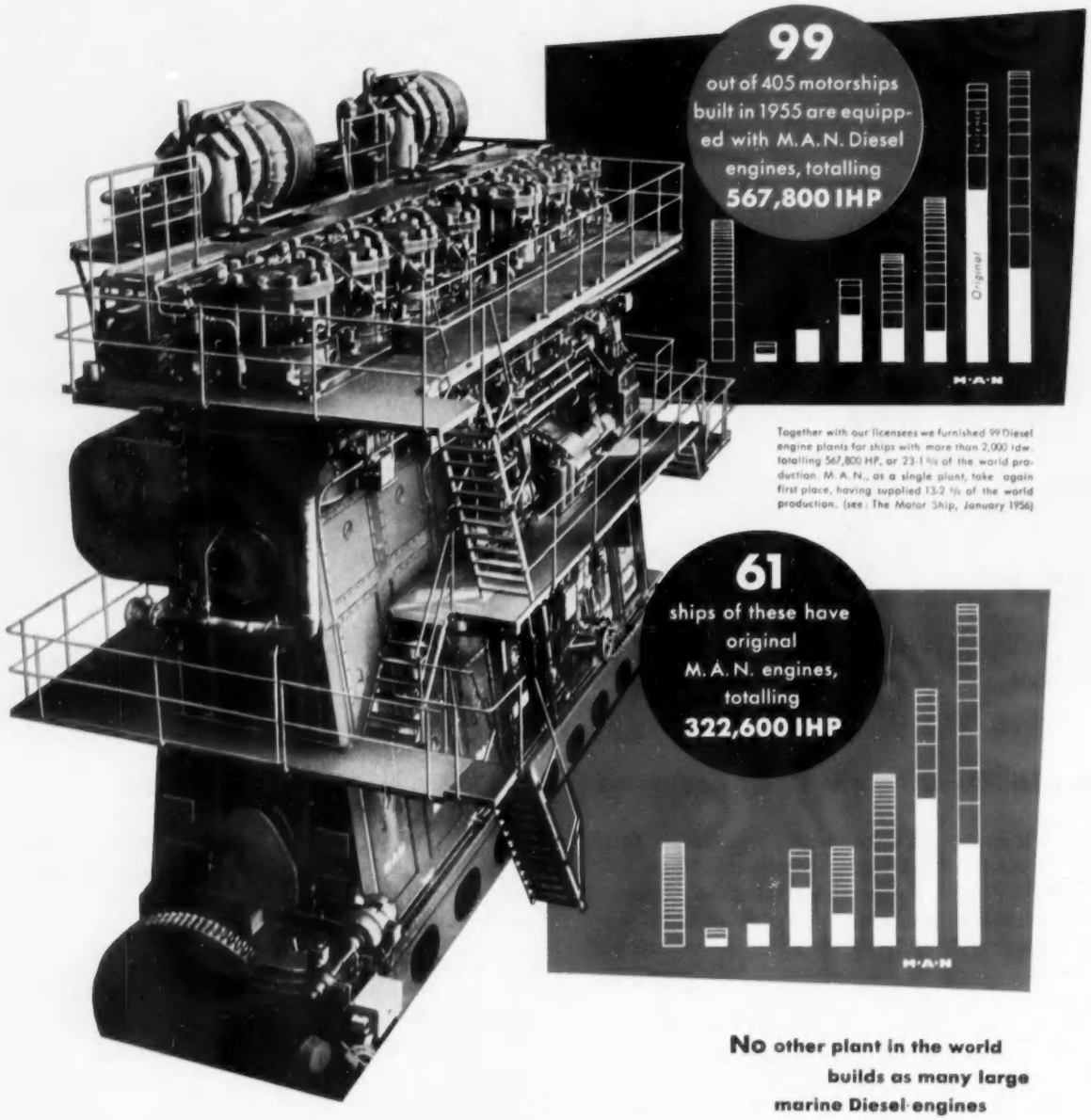
2 100% solvent refining of base stocks (which removes undesirable constituents) guarantees greater stability and more effective bearing protection.

3 Superior additive response is obtained by carefully matching the additives to the base stocks. This insures clean rings, grooves, oil cooling passages, and a minimum of piston crown deposits.

This combination of Dieselmotive qualities makes possible more hours of operation between ring jobs, and lower maintenance costs. Ask a Gulf Sales Engineer—experienced in Diesel engine operation—to recommend the proper grade of this outstanding lubricating oil for your Diesels. Contact him at your nearest Gulf office or write to Gulf Oil Corporation · Gulf Refining Company, 1822 Gulf Building, Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS



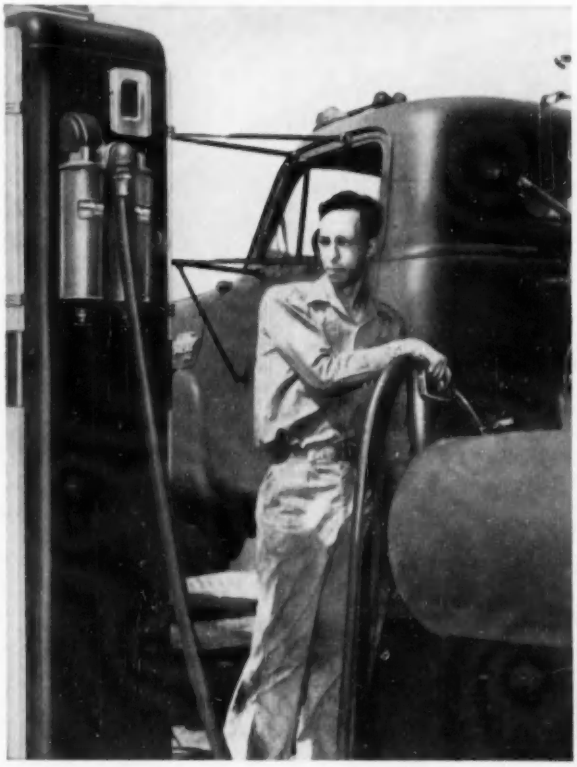
Together with our licensees we furnished 99 Diesel engine plants for ships with more than 2,000 tdw. totalling 567,800 HP, or 23·1 % of the world production. M. A. N., as a single plant, take again first place, having supplied 13·2 % of the world production. (see: The Motor Ship, January 1956)

No other plant in the world builds as many large marine Diesel-engines

M·A·N

M. A. N. build 2-cycle Diesel engines up to 15,000 BHP, 4-cycle Diesel engines up to about 4,000 BHP. For both types, research and tests of recent years were mainly devoted to supercharging. This led to high supercharging of 4-cycle engines and obtained, for the first time, an output increase of approximately 200 %. Supercharging 2-cycle engines permits increasing the cylinder output up to about 35 %. The larger types of the 4-cycle engines and all M. A. N. 2-cycle engines - naturally aspirated and supercharged - can be equipped for heavy oil operation.

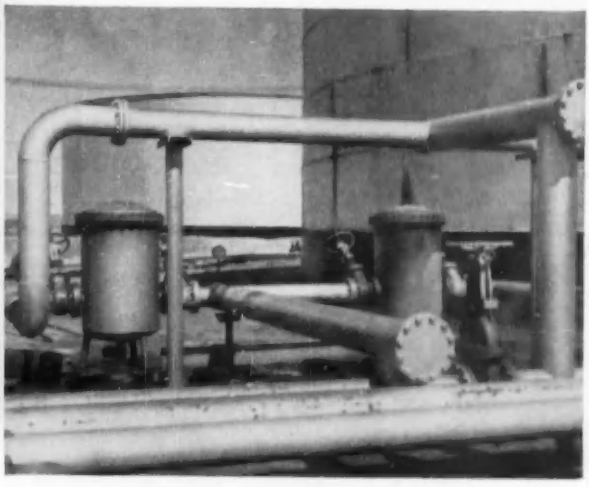
MASCHINENFABRIK AUGSBURG-NURNBERG AG. · WERK AUGSBURG
Represented in all countries



at the curb new Purolator dual fuel filter, PAG-25D, has a high flow rate of 25 GPM for diesel fuel combined with virtually no pressure drop. A final assurance to every customer that your product is clean.

or

at the terminal large bulk filtration equipment like this pedestal-type filter (PAG-300L to 1200L) can be used at high flow rates of from 300 to 1200 GPM. Reduces meter wear.



Purolator micronic® fuel filters remove rust

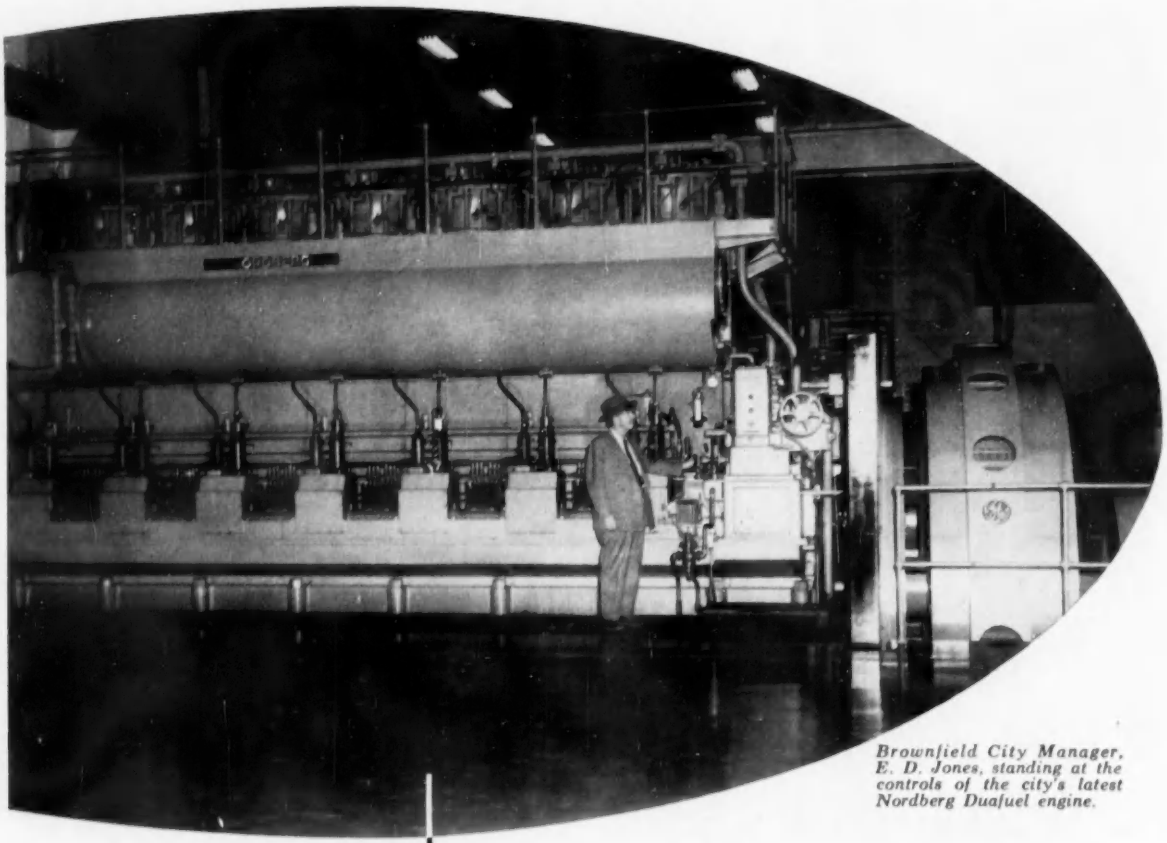
Despite rigid checks which prove the purity of fuel as it leaves the refinery, subsequent corrosion in storage tanks and pipes frequently contaminates it with particles of iron oxide. To remove rust particles, Purolator's engineers have developed the world's finest line of bulk filtration equipment. A recent addition to this line is Purolator's new curb pump filter. It has a filtration area of over 1800 square inches, achieved by 2 resin impregnated micronic fuel filters operating in parallel. Its development helps make certain that wherever you filter diesel fuel or gasoline ...at the curb or at the terminal...you can get precisely the right filter from Purolator.

PUROLATOR

"FIRST IN THE FIELD OF FILTERING"

For full details, write
Purolator Products, Inc.,
970 New Brunswick Ave.,
Rahway, N. J., Dept. B3-116

PUROLATOR PRODUCTS, INC., Rahway, N. J., and Toronto, Ontario, Canada



Brownfield City Manager, E. D. Jones, standing at the controls of the city's latest Nordberg Duafuel engine.

PAST PERFORMANCE COUNTS at Brownfield, Texas

Second NORDBERG Duafuel® Engine matches economy and reliability of first

IN 1951, the City of Brownfield, Texas placed its first Nordberg Duafuel® engine in municipal power plant service. This engine, driving a 2000 kw generator, has consistently turned in a good performance record and after 22,000 hours of operation, the only major maintenance required was one set of piston rings.

On the basis of this performance, Brownfield selected and installed its second Nordberg in 1954 . . . another Duafuel engine driving a 2700 kw generator. States Mr. E. D. Jones, Brownfield City Manager, "Reliability is no problem . . . the Nordberg engines pull 90% of the load with other engines carrying the balance. Both Nordbergs are compiling fine records of performance . . . the newest Nordberg has been on the line over 4,000 hours, generating 7,357,000 kwh and maintenance has amounted to only $42.00."

Write for further information about Nordberg engines, outlining your power requirements.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

BUILDERS OF AMERICA'S LARGEST HEAVY DUTY ENGINE LINE . . . 10 to over 12,000 HORSEPOWER

9755

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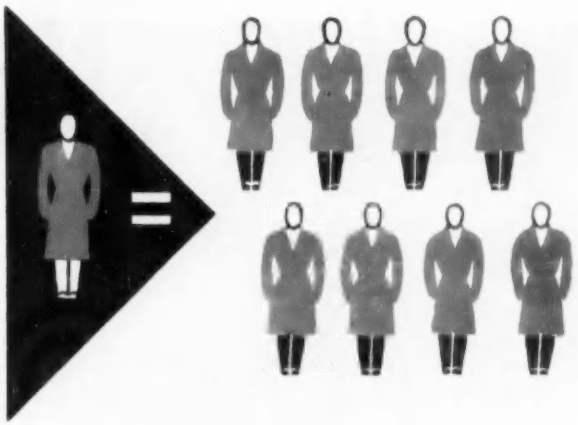
With

V-B Liquid Honing*

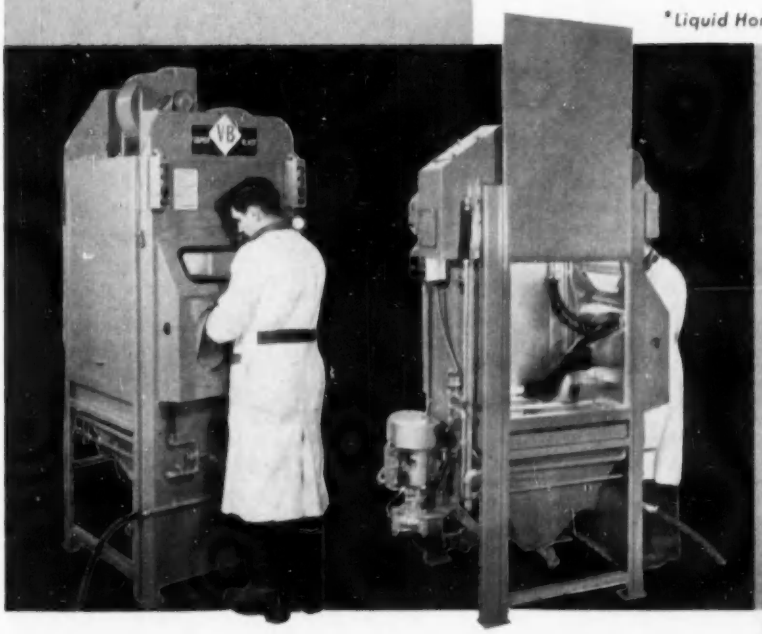
One Man Does Work of 8



Whatever *your* production problems — engine overhaul or surface conditioning of parts for O.E.M. — you'll find Liquid Honing paying for itself in a short time.

CONVENTIONAL methods prove slow and inefficient for deburring and cleaning the almost microscopic holes in this Diesel fuel injector cup. But Liquid Honing does the job *eight times as fast* — one man and one machine equaling the former production of eight men using another method. Best of all, Liquid Honing produces a smooth surface that promotes better fuel flow and cuts down gum and carbon deposits.

*Liquid Honing and Vapor Blast are trademarks.



to learn the whole story . . .

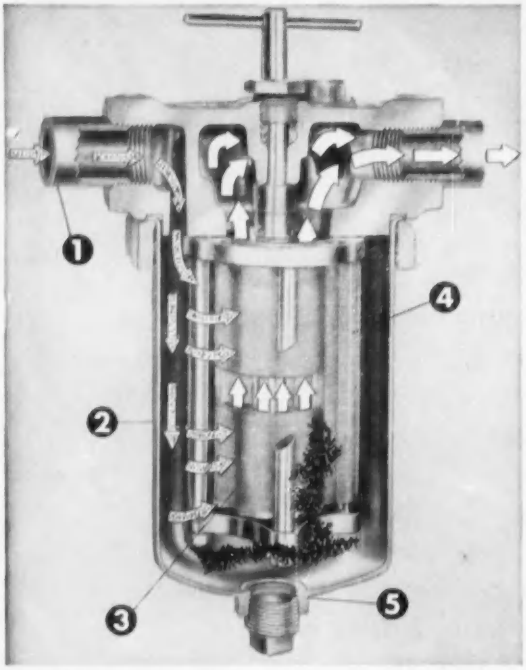
Send one of your parts for a processing demonstration and complete engineering report on the possibilities of Liquid Honing in your plant. No obligation.

V-B VAPOR BLAST MILWAUKEE, WISCONSIN

DOLLAR FOR DOLLAR, JOB FOR JOB, NO OTHER SURFACE-CONDITIONING METHOD CAN EQUAL VAPOR BLAST LIQUID HONING

VAPOR BLAST MFG. CO.
3061 WEST ATKINSON AVENUE
MILWAUKEE 16, WISCONSIN

New CUNO SUPER Auto-Klean Filter can boost engine life up to 50%



HOW IT WORKS. Dirty oil enters inlet (1) at left, fills housing (2) and flows through metal edge-type filter. (3) Clean oil rises through center of filter, leaves at right. Dirt combed out by cleaner blades (4) is removed through drain (5).

Here's what the U.S. Army has done to test Cuno's new 40-micron SUPER Auto-Klean filter for their engines:

They ran destruction tests on several identical engines equipped with different brands of filters. As they ran, dust was introduced into the air intakes. When compression fell to half its initial value, the test was stopped. Best life for engines equipped with cartridge-type filters was 60 hours.

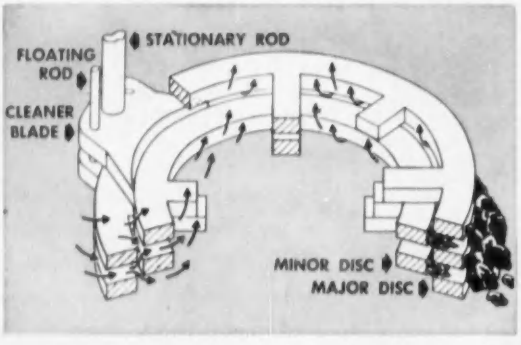
The engine with SUPER Auto-Klean ran 90 hours—50% longer—and *compression was still above half its initial value!*

You can get SUPER Auto-Klean now!

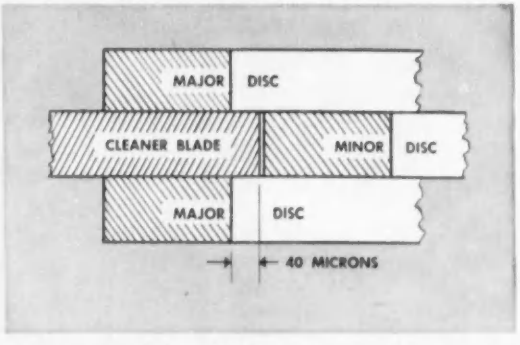
Just specify that the manufacturer equip your new diesel with this latest and best in filtration—both for fuel and full-flow lube. You'll get longer engine life and . . .

1. **Full-Flow** 40-micron filtration with a self-cleaning filter. No cartridge changes; filter can't rupture or channel.
2. **Low pressure drop.** An 8- by 2¾-inch filter element handles 30 gpm of 200 SSU lube oil with only 3 psi pressure drop. You get high capacity in a small package.
3. **All metal.** Can't absorb or adsorb additives from oil.
4. **No interruptions for cleaning.** Handles full flow all the time.
5. **Standard Auto-Klean housing.** On existing engines you can easily replace most 2¾ in. diameter cartridges with SUPER Auto-Klean or simply install SUPER Auto-Klean in the full-flow lube line following the discharge of the engine pump.

Write today for complete technical data on the new SUPER Auto-Klean for your new or existing diesel. Ask for Catalog No. SAK-057. Cuno Engineering Corporation, 9-6 South Vine Street, Meriden, Connecticut. 5.5



FILTER ELEMENT consists of stacked major and minor discs and cleaner blade bearing against precision ground minor disc. Oil flow is shown by arrows.



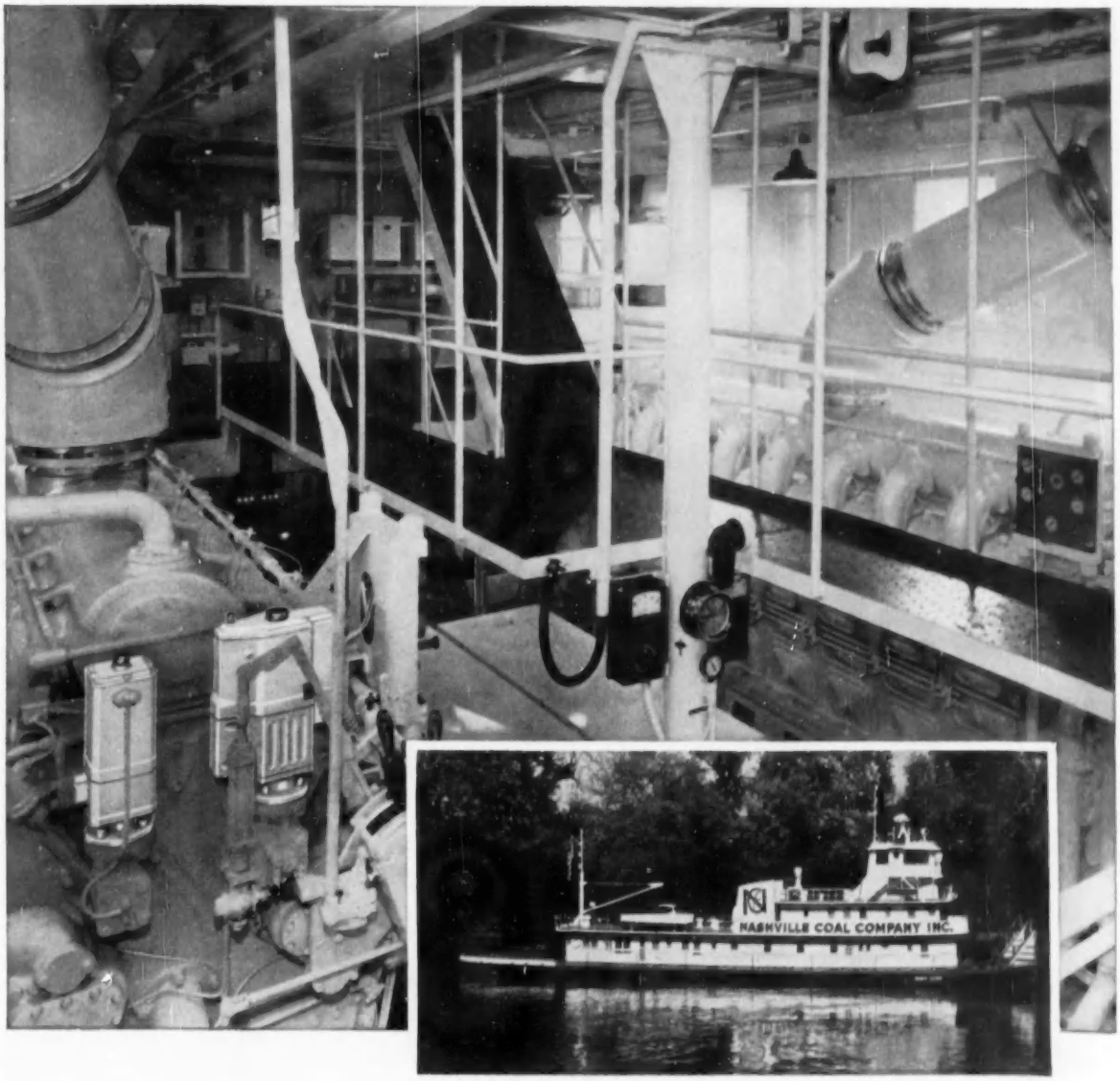
LARGE PARTICLES (over 0.012 in.) are stopped at space between major discs. Short 40-micron restriction stops 40-micron particles, but allows high flow rate.

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (edge-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)



New River Towboat equipped with Marquette HYDRAULIC GOVERNORS

Owner and Operator: Nashville Coal Co., Inc., Uniontown, Ky.

Designer and Builder: Nashville Bridge Co., Nashville, Tenn.

Engines: Built by Cleveland Diesel Engine Div. of General Motors Corp., Cleveland, Ohio.

Massey GOVERNORS

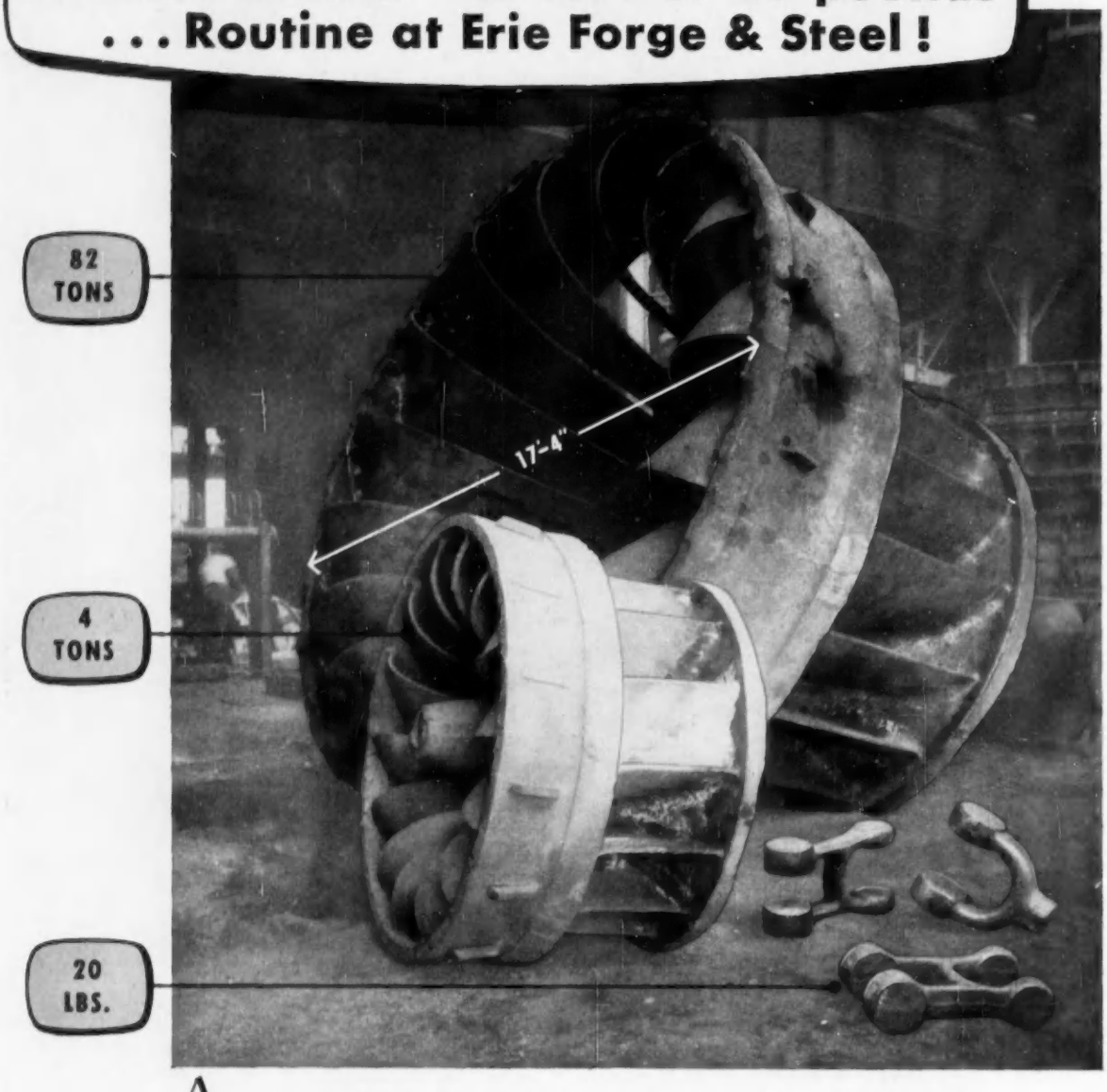
Marquette GOVERNORS

Engineering facilities and service agencies for Massey and Marquette Governors are at your disposal for all problems of governing and control.

MARQUETTE METAL PRODUCTS DIVISION
CURTISS-WRIGHT
CORPORATION • CLEVELAND 10, OHIO

Other Marquette Products: ROLLER BEARING TEXTILE SPINDLES WINDSHIELD WIPERS FOR AIRCRAFT • SPRING CLUTCHES ROTARY OIL PUMPS • PRECISION PARTS AND ASSEMBLIES

STEEL CASTINGS - 82 tons or 20 pounds ... Routine at Erie Forge & Steel!



A LONG JUMP from "the largest steel water wheel ever cast in one piece", 82 tons of it, to a 20 lb. engine casting . . . Routine at Erie Forge & Steel. Here is definite proof of our versatile production capabilities.

Engineers and metallurgists team up here with skilled craftsmen to control the production of steel castings and forgings from raw materials to finished product.

For example, engineering, metallurgy and production followed the 82 ton casting every step from raw materials to railroad spur to assure dimension and specification accuracy. "One responsibility and one control" is more than a slogan — here, it works for you.

ERIE FORGE & STEEL CORPORATION • ERIE, PENNSYLVANIA

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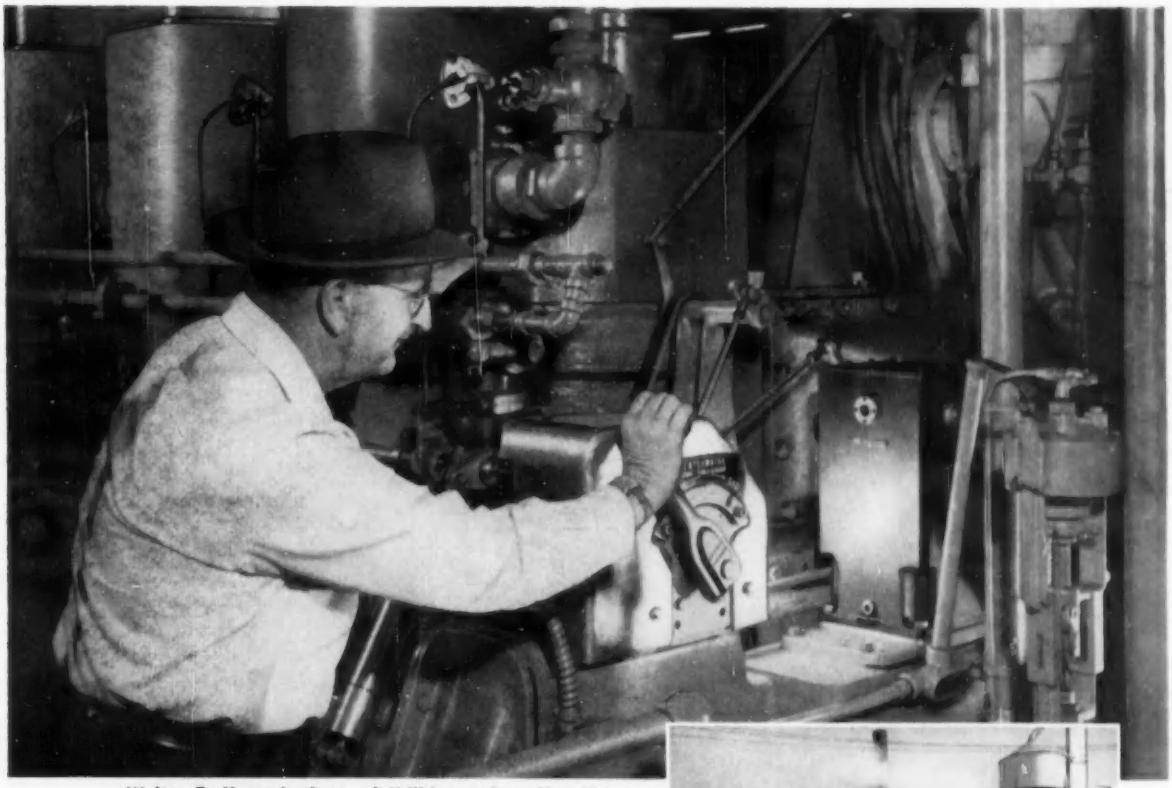


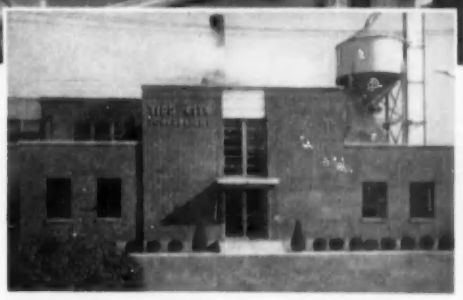
Walter T. Messeck, Supt. of Utilities at Tipp City, Ohio, sets Enterprise "Select-O-Matic" control for Dual Fuel operation.

Dual Fuel? Heavy Fuel? Tipp City, Ohio, Profits From Both With Their Two Modern Enterprise Engines

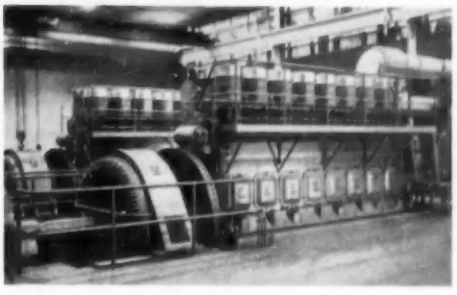
As long as fuel prices fluctuate, and availability of different fuels varies, Enterprise "Select-O-Matic"® Dual Fuel engine systems contribute important savings in power production.

This is the case at Tipp City, Ohio, where they converted their Enterprise Engines from straight diesel operation just two years ago. Dual fuel operation on natural gas and No. 2 diesel pilot fuel is alternated on a seasonal basis, with straight diesel operation using either light or heavy fuel oils, depending on the current market price of the various grades of oil, during the winter months when gas is not available. Gas and heavy fuel operation is economical, and in this business the saving of as little as 1 mill per kilowatt hour amounts to a pretty penny when you're generating 9,488,200 KW hours a year as was the case at Tipp City in 1955.

Let us show you how Enterprise Dual Fuel economy can improve *your* operations. Write today for full information, or call your nearest Enterprise sales and service office.



The Tipp City Diesel Power Plant is a modern show place. Hundreds of visitors have inspected this efficient, well-run operation where two 1755 HP Enterprise Turbo-charged Engines supply all the power. Dual fuel and heavy fuel systems were installed in 1954, to take full advantage of the less expensive fuels available.



ENTERPRISE
dependable **ENGINES**

Over a million horsepower at work the world over!

ENTERPRISE ENGINE & MACHINERY CO.
Subsidiary of General Metals Corporation
18th and Florida Streets, San Francisco 10, California
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Boston • Chicago • Denver • Des Moines • Fort Worth • Huntington • Jacksonville • Kansas City • Los Angeles • Minneapolis
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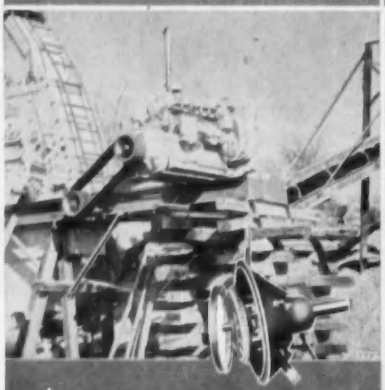
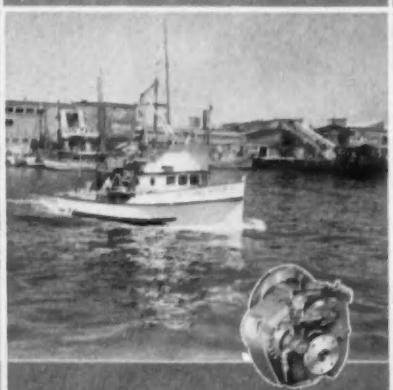
CRAWLER TORQUE CONVERTER

FLUID POWER TAKE-OFF

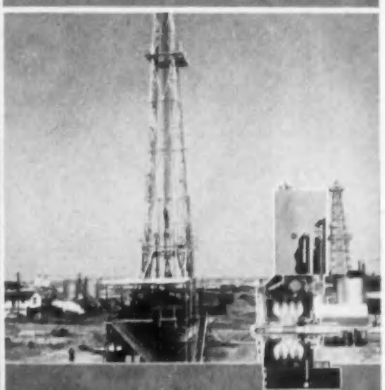
TRUCK-TYPE TORQUE CONVERTER



FRICTION POWER TAKE-OFF



MARINE GEAR



DISCONNECTING FLUID PTO

Wherever you find diesel power . . . you find TWIN DISC!

In industry today—wherever *diesel* power is applied to driven equipment—you find Twin Disc Friction Clutches or Fluid Drives.

In construction, mining, quarrying and logging, you'll find the biggest crawler tractors driving through Twin Disc Torque Converters . . . power shovels, equipped with either Twin Disc Converters or Fluid Power Take-Offs . . . trucks incorporating Twin Disc Truck-Type Torque Converters . . . and stationary power units, equipped with heavy-duty Twin Disc Friction Power Take-Offs.

In the oil fields—*throughout the world*—you'll find diesel engines, on drilling rigs, driving through Twin Disc Torque Converters or Model HUD Disconnecting Fluid Power Take-Offs.

Today, Twin Disc is recognized as the world's largest exclusive manufacturer of a complete line of friction and fluid drives—for correctly linking horsepower to industrial powered equipment. Since 1918, Twin Disc *Specialists* have designed and built friction and fluid drives *for* that one purpose.

If *you* have a power transmission problem—consult the Twin Disc Clutch Company, Racine, Wis., Hydraulic Division, Rockford, Ill.

TWIN DISC

TWIN DISC

Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division) Rockford, Illinois

He can't settle for anything less than A PERFECT SEAL

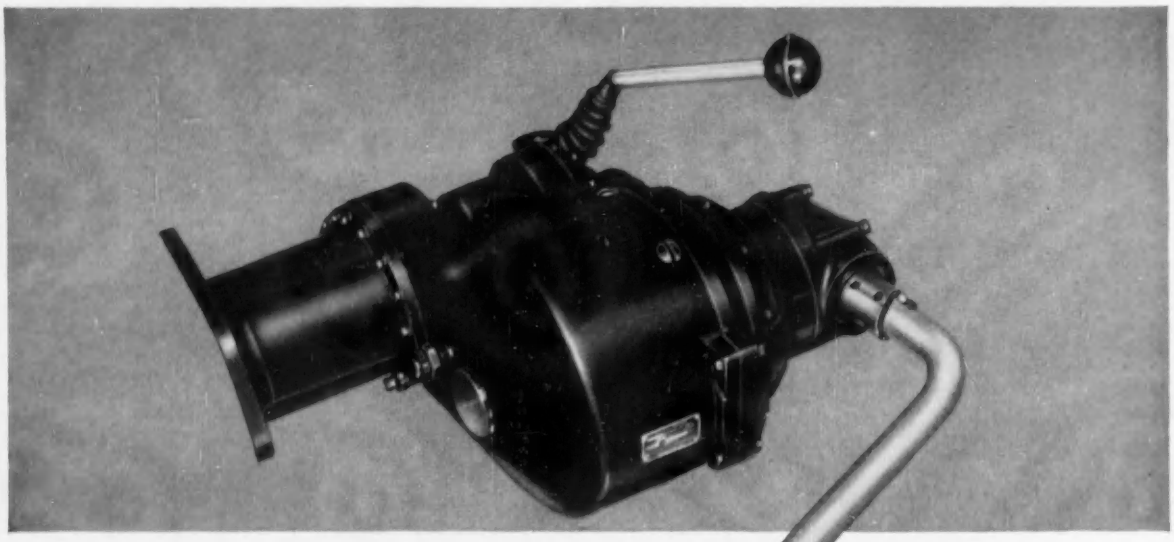
To the deep-sea diver, anything less than a perfect seal would be a mistake

Likewise, the efficiency of your gas and diesel engines is related to the perfection of a seal —the one formed by the piston rings. Don't *you* settle for less than the seal which is made possible by Pedrick *Formflex* oil rings—the most perfect seal you can get from any piston rings. This is so because of the exclusive Formflex "Equalizer" which provides the utmost in uniformity of pressure, flexibility and conformability. Thus, it meters exactly the right amount of oil to the top rings to assure a perfect seal.

Engineered Sets or open-stock rings, you'll get more efficient performance from top to bottom groove with Pedrick Rings. Pedrick Engineering Service is available to help you with special problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, SAratoga 9-3770.

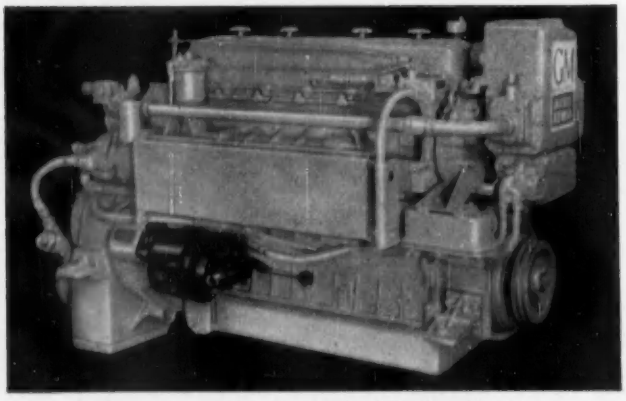
Pedrick
PISTON RINGS

PEDRICK PRECISIONEERING KEEPS PEDRICK FIRST



Bendix* AE

HAND-CRANKED INERTIA STARTER



Performance proved on thousands of diesel- and ignition-fired marine and industrial engine installations.

To low installation cost, add rugged, simple design and dependable operation. Then you have the explanation of why the Bendix AE hand-cranked inertia starter is in such big demand by men in the oil, marine, construction, agriculture and mining fields. Particularly in remote areas and under difficult operating and climatic conditions, this starter fills a very real need. For full details write BENDIX INTERNATIONAL, DIVISION OF BENDIX AVIATION CORPORATION, 205 East 42nd Street, New York 17, N.Y. Cable: "Bendixint", N.Y.

COSTS LESS TO INSTALL

HERE'S WHY:

- **Requires NO CABLES, NO PUMPS, NO PLUMBING**
- **More easily mounted and in more positions**
- **Can be installed in ten minutes without the use of any special tools**
- **Completely self contained . . . no "extras" to buy**

Bendix INTERNATIONAL Product

Bendix AVIATION CORPORATION

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MaK

MARINE DIESEL ENGINES UP TO 2000 HP

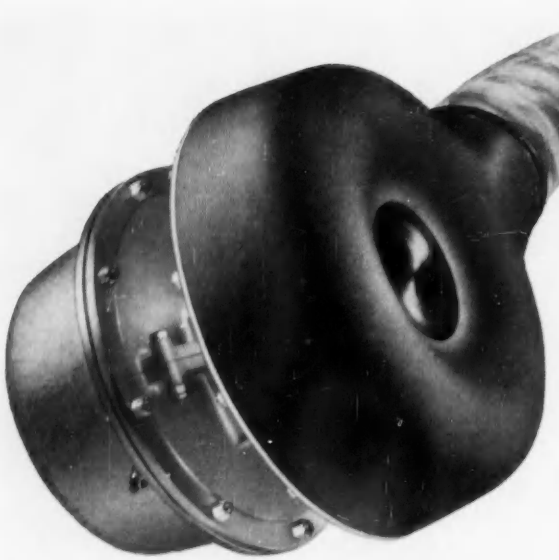
For coastal shipping and trans-continental service for single- double- and 4 engine propulsion units.

The type M 582 engines are equipped with light alloy pistons for better heat dissipation.

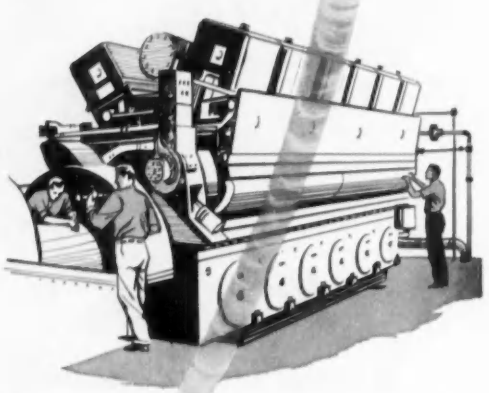
"9 and 10 cylinder engines—upper picture—have parted cylinder blocks and two-parted crankshafts. All components are amply dimensioned for heavy duty. Special leaflets on request."

MASCHINENBAU KIEL AKTIENGESELLSCHAFT

GERMANY



MORE DRIVE for your diesel!



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✶ Adds more power in relation to size and weight than any other units in this field.

✶ Decreases fuel consumption. Besides decreasing costs, this factor greatly increases the non-refueling range for mobile equipment.

✶ Provides power as needed by responding rapidly to acceleration requirements. This factor greatly decreases smoking.

✶ Maintains sea-level power under all altitude conditions.

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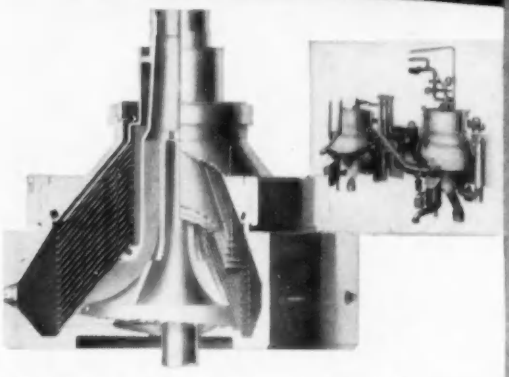

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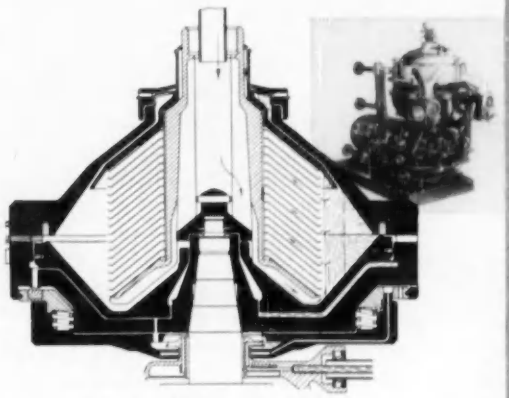

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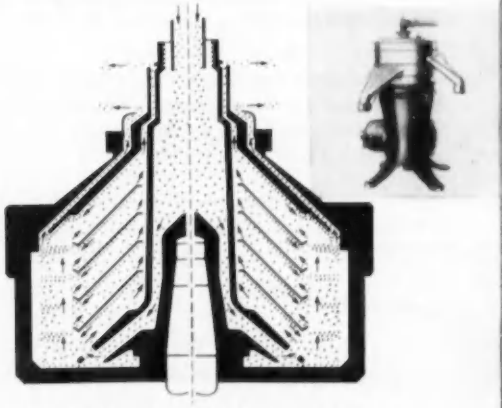

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VIS.	TEMP.	AC-VO	PX 209. F	MODEL 94
500	180° F	1200	600	300
700	180° F	1100	550	275
1700	180° F	660	330	165
2500	180° F	560	280	140
4000	190° F	440	220	110
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Heavy Oil Purifiers

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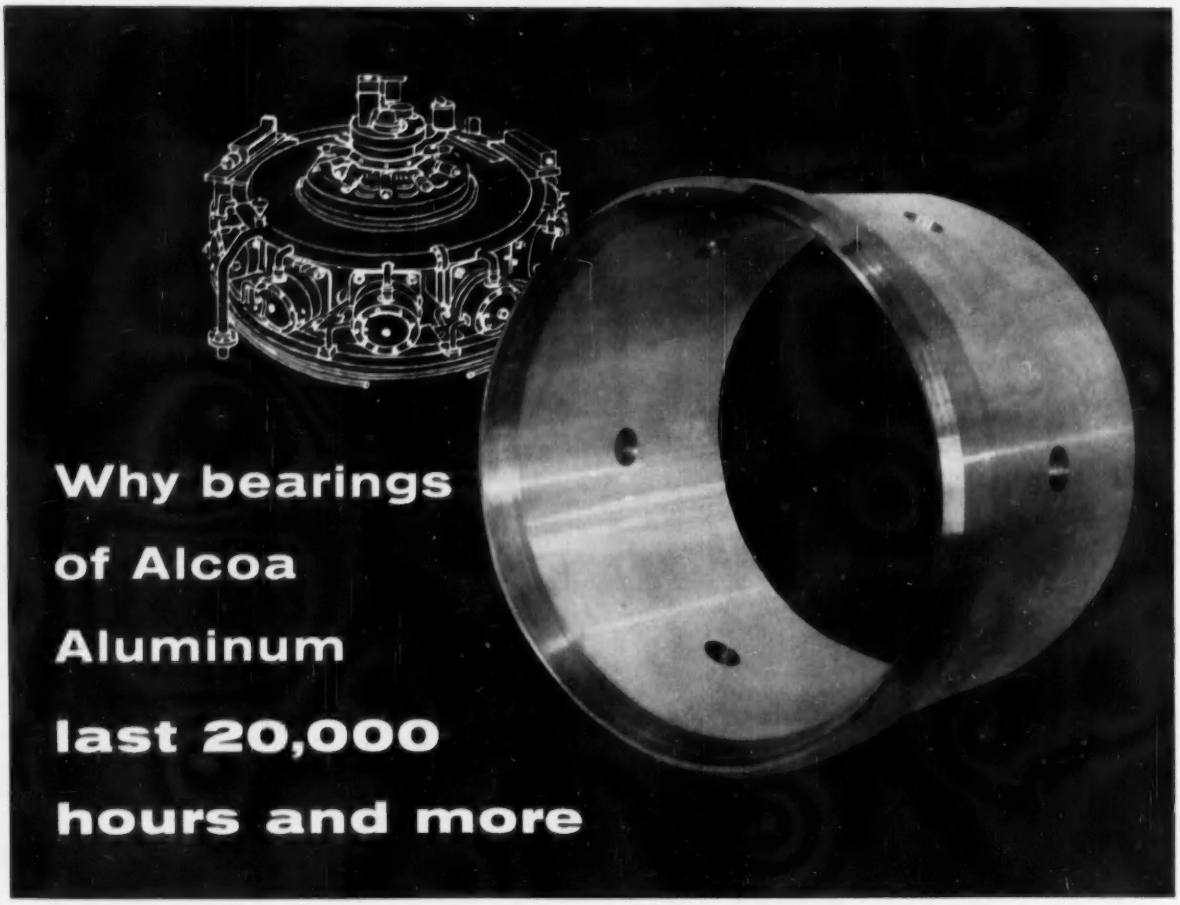

Nordberg Manufacturing Company uses full round solid bushings of Alcoa® Aluminum in big gas burning radial engines. The record: over 20,000 hours without failure.

Bearings and bushings of Alcoa Aluminum have a truly superb performance record as compared with bronze and babbitt because aluminum has an *unmatched combination of advantages.*

Highest load capacity—Only aluminum can be used for solid bearings in heavy-duty service. Load capacities go as high as 10,000 psi on projected area.

20° cooler running—Aluminum bearings run up to 20° cooler than conventional bearings because of aluminum's excellent heat conductivity. There's less danger of seizure, burnouts.

Excellent conformability—Ductile aluminum conforms readily to any misalignment. This reduces unit loading, makes bearings last longer.

Handles dirt well—Dirt particles readily roll out of aluminum bearings. Aluminum embeds better than bronze, not as deeply as babbitt.

No corrosion problem—No protection coatings are needed on aluminum and there's no worry about corrosion from oil additives.

No failure damage—With no hard backing material, solid bearings of Alcoa Aluminum cannot cause shaft damage in event of bearing failure.

Great design flexibility—Alcoa bearing alloys have good *structural* properties, too. You can design connecting rods that need no bushings, water-cooled bearings with integral cooling passages, full-floating bearings.

It will pay you to learn more about cast bearings of solid Alcoa Aluminum. Check your bearing manufacturer or write: Aluminum Company of America, 1988-F Alcoa Building, Pittsburgh 19, Pa.

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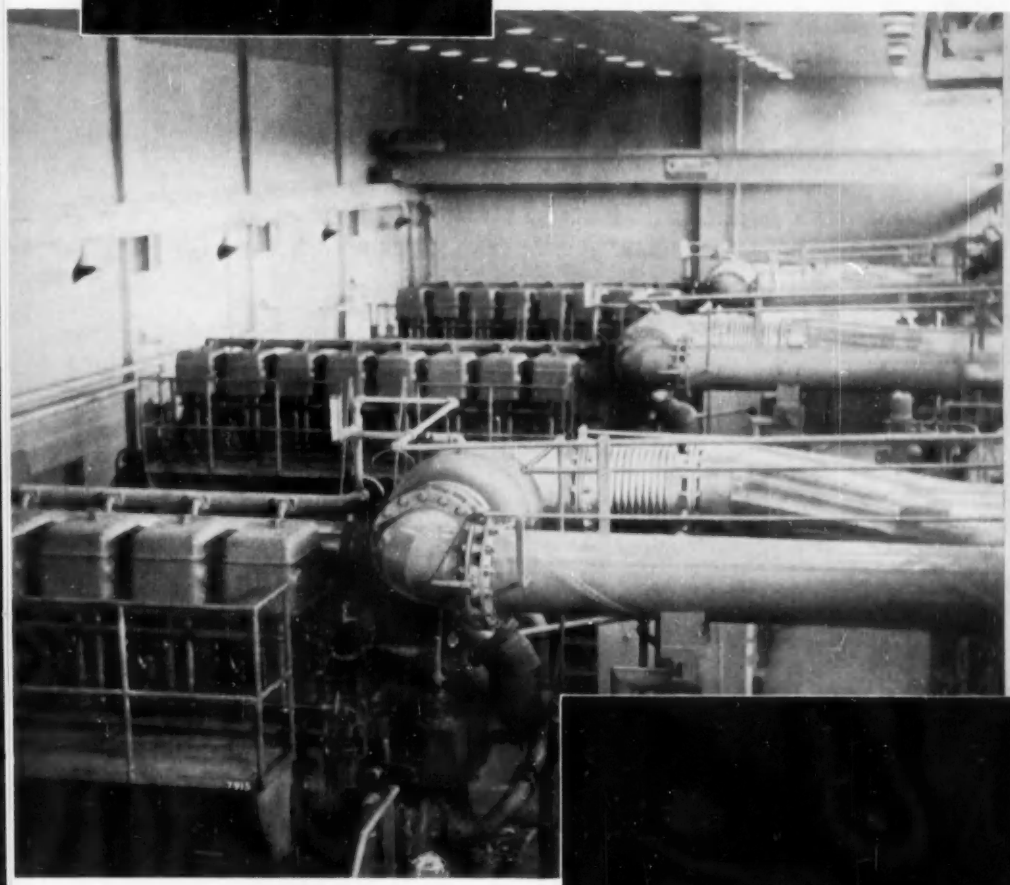
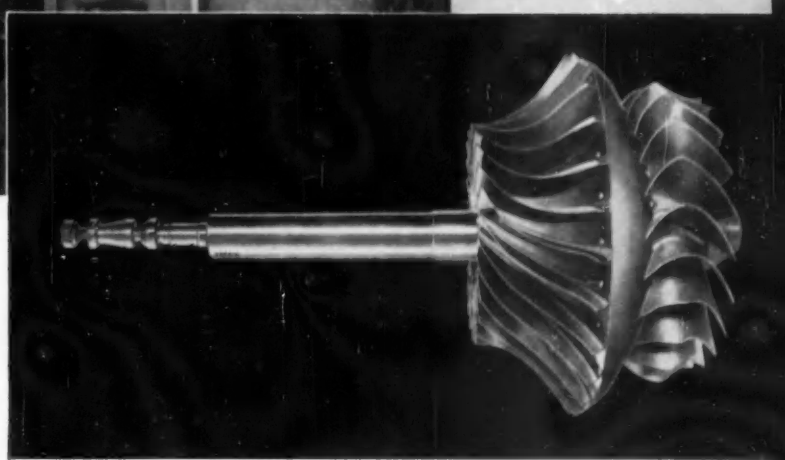
HIGH PRESSURE TURBOCHARGERS

efficiently serve diesels at Lakehead Pipe Line Company



Exclusive
MONOROTOR
Construction



Located in an outlying district in Northern Minnesota, this oil pumping station of the Lakehead Pipe Line Company must have *dependable, efficient* equipment. That's why Nordberg Diesel engines *with De Laval High Pressure Turbochargers* were chosen for this service.

The De Laval turbochargers efficiently utilize the exhaust gases to supply the high intake air requirements of these 1800 BHP, eight cylinder, four-cycle Supairthermal engines. Shown in the photograph are three units. Six other identical engines operate in pairs in three other stations of this company.

Due to the exclusive Monorotor design, De Laval High Pressure Turbochargers have a pressure ratio up to 3:1, as well as far higher pressure and turbine efficiencies than those found in conventional turbocharger systems. They are self-adjusting to engine loads, can be used with 4- *and* 2-cycle engines.

Write for De Laval Bulletin 3000 giving comprehensive curves and flow range diagrams.

DE LAVAL *Turbochargers*

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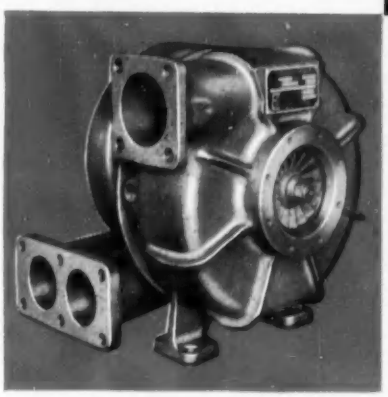

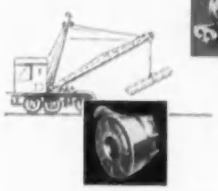

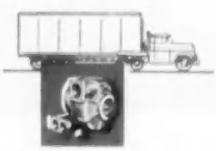

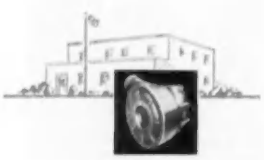

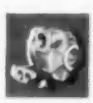

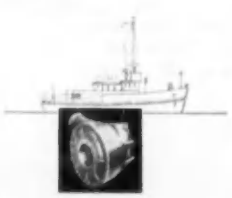

MG-1

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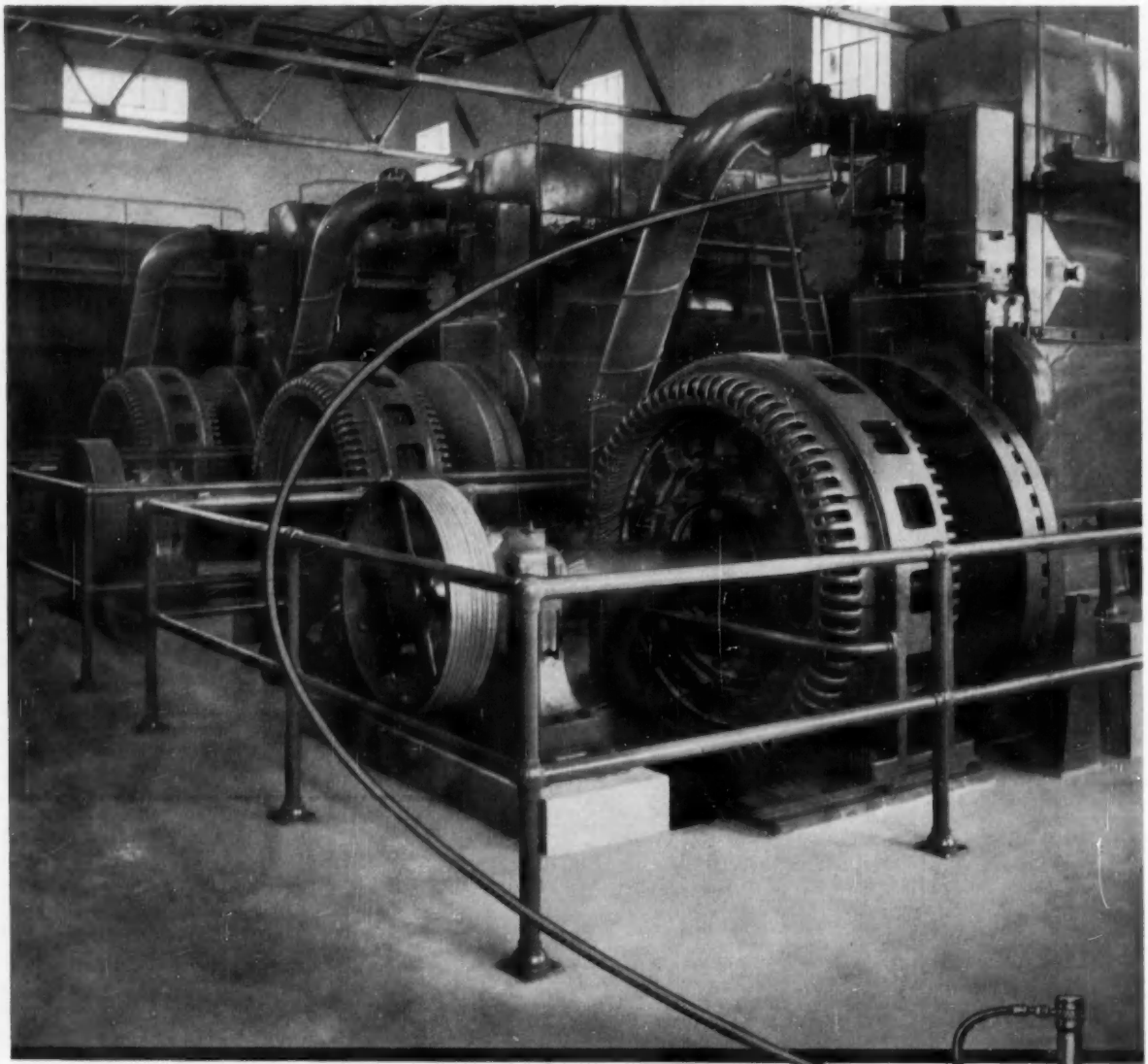
ELLIOTT has a background of more than 16 years experience in DESIGNING, MANUFACTURING and APPLYING turbochargers to diesel engines. During this time, millions of horsepower of diesel engines have been turbocharged by Elliott. These turbocharged engines cover the field—stationary plants, large motorships, fishing vessels, luxurious yachts, railroad locomotives, trucks, off highway tractors, well drilling rigs, etc.

This experience means added assurance of dependability in turbocharged diesel engine performance. Make sure your next diesel engine has a "performance-proven" Elliott turbocharger.



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Let RUBILENE help solve your lubrication problems. Regardless of the make or age of your Diesel, where a high VI oil is needed, there's a member of Sinclair's RUBILENE or RUBILENE HD family that meets your requirements exactly. Call your local Sinclair Representative for further information or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Ave., New York 20, N. Y. *There's no obligation.*

SINCLAIR RUBILENE OILS

Shakeups are Good

If you'll look at the bottom of the Contents page you'll see that we just moved our offices. After 27 years at the old stand, you can imagine the musty, dusty hoard of a series of packrat editors. If you're hepped on nostalgia, we had the makings—a ton or so of diesel memorabilia. At one time it was hot editorial material but now no longer timely or important. The sheer economics of moving such space and weight forced an evaluation of this data and elimination of excess baggage—something long planned but never gotten to in our normal routine. We were able to review procedures too; it was a good chance to streamline. We did it and we're glad. This sort of thing should be done periodically. By you too. Nothing so drastic as moving is necessary; just set aside time to take inventory and be sure that you are doing things the best and most economic way. In our job we get a chance to see different operations and from an outsider's viewpoint compare them and see sore spots. For example, in one heavy equipment repair shop, several mechanics were seen standing around the parts window. The parts room was a mess— inadequate stock control, poor storage facilities, and a general jumble. Mechanics waited while the parts man searched. A cleanup and institution of a system to get the right parts to the mechanics would save their time, reduce delays from parts not on hand, and cut losses from damaged or rusted parts. These bad situations just "grow" unless you're continually alert. Another case of "just never thought of it" occurred in an accessory overhaul shop. A lot of new dowel pins were being used and as some holes were worn, a lot of hand fitting took place. Knowing the shop owner well, we suggested use of "roll pins" and he tried them. Worked out fine and saved him money. In a similar shop a skilled mechanic spent a lot of his time removing and replacing small cover nuts *with an end-wrench*. A nudge in the boss's inertia got a nut runner on the job. In our own case, this opportunity for a new look and cleanup has been very helpful. Try it in your business; it will work for you too.

B P E

Diesel Engines need Sealed Power Cyclan Piston Rings because...

Cyclan rings will not break in service.

Cyclan rings show 70% less wear than cast iron rings.

Cyclan rings have the impact strength to deflect without damage.

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highlights

Nothing but diesel-electric locomotives, a total of 535 units, went into service on Class I railroads the first four months of this year. In the same period last year, 413 units were installed, five of which were electric.

A 75% increase in US sales of Deutz diesels is reported for the first quarter of this year. More than 200,000 of these air-cooled units have been placed in operation over the world since 1948.

Lowest bid on locomotives to replace those that tow ships through Panama Canal locks has apparently been submitted by R. G. LeTourneau, the company announces. Its bid was for 30 diesel units to replace the 67 locomotives now in service.

Make way Lucifer, we're digging you now. For the first time in history, oil has been brought up from more than 4 mi underground. This from the deepest man-made hole in the world—a wildcat, 22,570-ft down in Plaquemines Parish, La.

Ultrasonic washing equipment is the latest venture of Curtiss-Wright Corp. This method employs inaudible frequency vibrations which are transmitted to a cleaning solvent by means of a transducer. The sound waves cause the solvent to vibrate, setting up a powerful scrubbing action that dislodges dirt and grease without damage to the most delicate parts.

Man-made industrial diamonds are now being produced in limited quantities at the Detroit pilot plant of General Electric's Carboloy Dept. A cluster of the first of these, identical in every way to naturals, has been presented to the Smithsonian Institute.

Full conversion to diesel power is underway at Chicago & Northwestern Railway. There are only about 30 steamers left in operation.

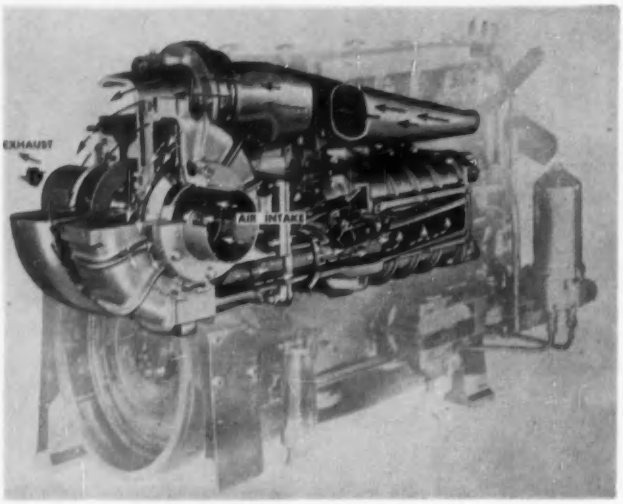
Welding of metals without heat has been achieved through use of supersonic vibrations. Two scientists made the discovery while studying the effects on metals in airplanes flying faster than sound. The supersonic waves caused the metal molecules to vibrate rapidly and to merge with each other until they were fused.

One hundred 50-passenger diesel buses are being purchased by Boston's Metropolitan Transit Authority. General Motors is building 50 of them; the other 50 will come from Mack.

The diesel-electric railroad fleet rose from 3600 to 25,000 units in the US since the end of World War II. Statistics for 1955 show them performing 85% of all freight service, 88% of all passenger service, and 91% of all switching service.

Diesel engines that develop ¼ hp at 11,000 rpm are being made in Germany. They'll be powering automobiles, trucks, and planes—toy models, that is.

Major rehabilitation of Brazilian railroads has been recommended by a joint Brazil-US commission. It calls for extensive modernization and addition of new equipment, including 170 diesel-electric locomotives. A growing number of countries are adopting US railroad standards in this modernization trend, making it easier to provide replacement parts for US locomotives operating abroad.



Exhaust gas and air flow in the components of the intake air system shown in place against a phantomed 6-cyl Series 71T engine.

Detroit Diesel Introduces....

TURBOPOWER

Small high-speed 2-cycle engine turbocharging is here. Teaming of a turbocharger with a mechanical blower is obtaining important horsepower boosts and economic advantages. Modifications of the basic Series 71 design for efficient use of the additional air are discussed.

"71T" is a new member of Detroit Diesel's Series 71 engine family. "T" stands for "Turbopower". Their engineers have teamed a turbocharger with a blower to get higher outputs and improved performance characteristics with both 4-71's and 6-71's.

Turbopower models for three basic types of service are currently offered. There are two fan-to-flywheel models, the 6130T and the 4171T. Then there is the 6140T industrial model. Four marine models, two standard and two light-weight versions are built. Standard models are the 6120T and 6121T, right and left hand rotation respectively, and the aluminum engines, 6122T and 6123T, also right and left hand rotation respectively. The first figure of the model number indicates the number of cylinders.

One thing should be made clear right now. The "T" models are intended to supplement the Series 71 line, not replace any of the existing models. The top range of single-engine horsepower has been increased by about 15% and a closer match of engine to power requirement is possible throughout the line.

For example, in applications where the actual power requirement is marginal between the standard 6-71 and the 4-71 ratings, the new 4171T would fill the bill. In installations where weight and space considerations are important, the "T" model is a happy solution.

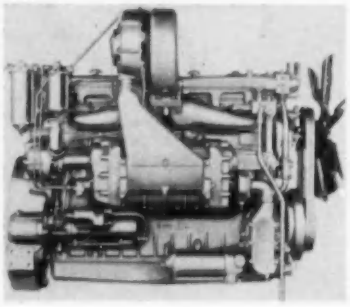
Turbocharging offers many advantages. To prove this, all you have to do is to look at the acceptance it has gained in the past few years. But it is only recently that 2-cycle engine turbocharging has become a reality and this is the first time in this country that it has been applied commercially to relatively small, high-speed engines.

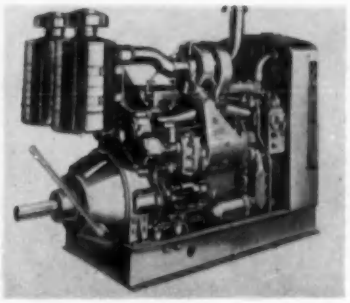
Basically, engine output is limited by the amount of air that can be supplied to the cylinders and the ability of the cylinder parts to withstand high temperatures. Turbocharging has the double appeal of providing more air by utilizing waste exhaust gas energy for power and, secondly, of cooling the cylinder parts by better scavenging and a "blow-through" of excess air.

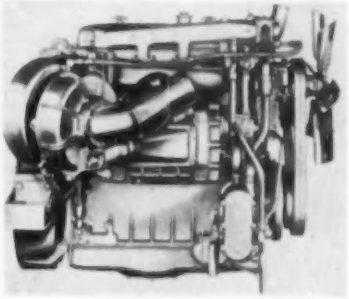
So a primary advantage is higher output with a reduction in weight per horsepower. Better scavenging and more favorable air/fuel ratios improve combustion. This results in better fuel efficiency and cleaner exhaust over a wider range. At the same time the cooling features offset the detrimental effects of the high temperatures normally involved with the higher cylinder pressures.

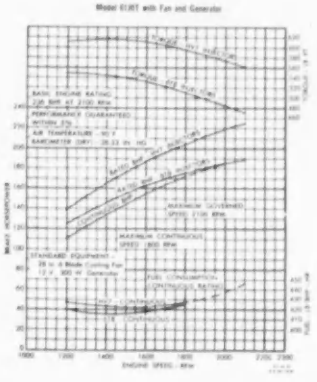
This is the general picture of turbocharging. Two-cycle engines, however, are a special problem. Having a power stroke every revolution, some method of supplying intake air is necessary. The engine usually supplies the power for this, a parasitic loss. Cylinder bmep's in 2-cycle engines are normally lower than for 4-cycle engines, largely due to the economics of getting air into the cylinders.

Turbocharging, therefore, looks very attractive but the low exhaust energy at part loads and during starting is the headache. The whole idea was impractical before the advent of today's turbochargers with their high overall efficiency. Now let's see how Detroit Diesel's engineers tackled the problem.

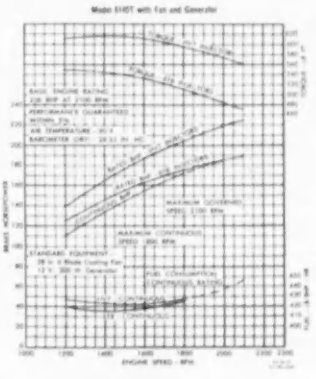




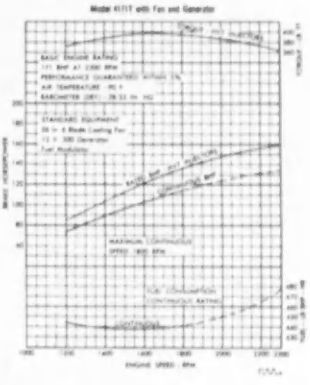




Arrangement of turbo and blower on Model 6130T. Performance with the standard HV7 and optional 6T8 injectors, both with M-5 turbochargers, is shown in the chart.



Model 6140T industrial unit with power take-off. Performance with both the 60 cu mm and 70 cu mm injectors is shown for rated (intermittent) and continuous bhp.



Arrangement of the intake air system on the Model 4171T fan-to-flywheel version. With this model only the "HV7" injector is used with performance data as shown.

Engine Breathing

Since the fundamental problem is to get the most air into the engine with the least expenditure of engine horsepower, any means of reducing horsepower to the blower while increasing air supply would yield higher net horsepower. So the combination of blower plus turbocharger was exploited.

A 2-stage supercharging system was devised. The mechanical blower would provide air necessary at starting and at speeds down near idling. At engine speeds of about 800 rpm the total air from the turbocharger plus that from the reduced-speed blower equals the output of the standard blower. At all engine speeds above 800 rpm, total air output from the combined units exceeds that obtained with the standard blower.

In the normal operating range, air undergoes a pressure rise across the turbocharger and gets a second boost across the blower. The net result is air box pressures just about double those of the standard Series 71 engine. Yet the parasitic load on the engine is considerably reduced.

Tests showed that in the 6-71T engine, of a total horsepower gain of 36 hp, half was attributable to reduced blower load while the second half resulted from improved combustion.

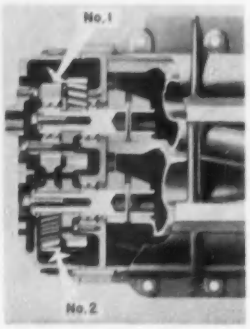
Use of the turbocharger has virtually eliminated one limiting characteristic of mechanical blowers. Delivery characteristics of these units are proportional to speed alone. In other words, you would be getting the same amount of air at maximum engine speed regardless of whether the load at that speed was high or low. Think of the effect on the air/fuel ratio.

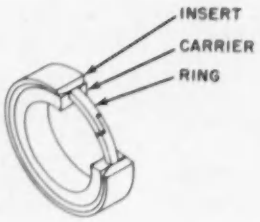
By contrast, delivery characteristics of turbochargers are responsive to engine load. More load, more exhaust energy. In this combination system the turbo, sensing load, would vary the air delivery to the blower inlet accordingly, and hence, air box pressure. The result is closer control of air/fuel ratios throughout the engine's operating range.

Furthering this idea of controlling air/fuel ratios, two sizes of turbochargers are used. The smaller is used with the 4-71T engine and some applications of the 6-71T engine where it is not necessary to attain maximum potential output. Otherwise, the 6-71T engine use the larger unit. Also, turbochargers and injectors of different delivery capacity must be used in the factory-designated combinations.

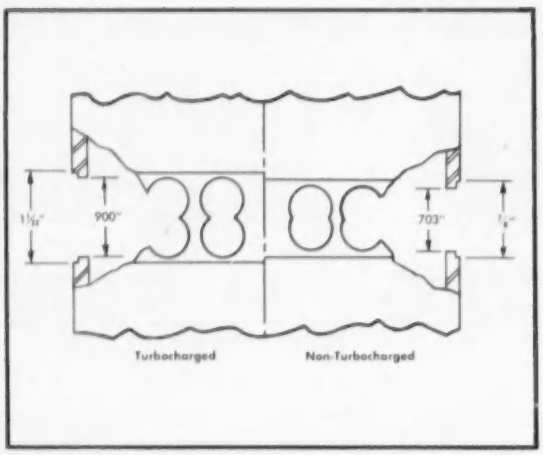
A detailed description of the turbocharger is given in another article in this issue. Different mountings are used according to engine and application but in all cases a single open manifold conducts the exhaust gas to the turbine inlet. There is full 360-deg emission through the nozzle rings.

Turbocharger size, nozzle rings, manifolding and

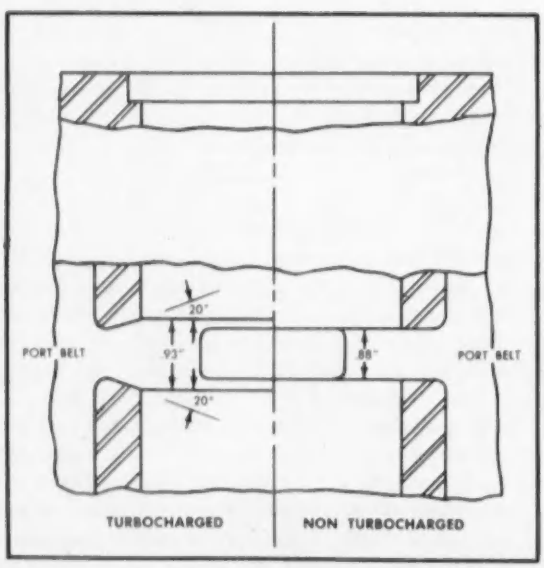




Principal blower modification is in gearing to reduce rpm. Quill shaft drives independently-mounted gear (No. 1) meshing with gear (No. 2) splined to lower shaft. New seal is at right.



Comparison of standard and new cylinder liner porting.



Similar comparison shows changes in the block porting.

blower characteristics were all carefully figured to insure that inlet manifold pressures always exceed exhaust manifold pressures by an amount sufficient to provide positive scavenging. In addition, a good many changes were made to improve engine breathing and to utilize the added air to best advantage.

Since Detroit Diesel has held to their policy of making improvements while sticking to the basic engine design, these can best be shown by comparison with similar components of the standard 71's.

Engine and Component Modifications

Since we're dealing with more air at higher pressures, it figures that the bulk of modification would deal with those parts concerned with air flow. We'll start with the blower and go right on through.

Blower Modification—There has been no change in the general design. Blower speed has been reduced from 1.95:1 to 1.55:1 by an additional pair of gears in the drive-end housing. The conventional quill drive turns an independently-mounted gear that meshes with the second added gear. This gear is splined to the lower rotor shaft. Thus the lower rotor is now the driver and drives the upper rotor through the conventional timing gears.

A new ring-type blower oil seal is used. Besides giving positive sealing it eliminates the wear encountered with the lip-type seal.

Porting Changes—Both liner and block porting heights have been increased. This extends the scavenging time. Comparative dimensions are illustrated. A look at the timing diagram shows the effect in relationship to exhaust timing.

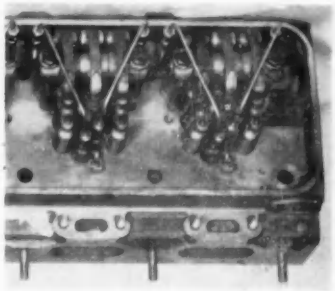
Valving Changes—Four valves per cylinder are now used. Valve head diameter is now 1.20-in compared to 1.584-in in the 2-valve head. While the total area has been only moderately increased, flow is better and cooling problems decreased due to the added seat area and shorter heat paths. Note the increased material around the injector opening, a desirable feature.

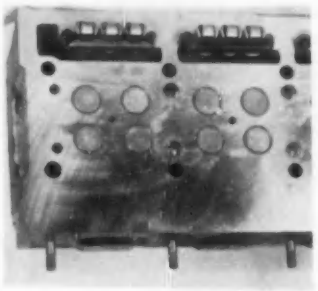
Valve timing and injector timing have not been changed so the same camshaft and actuating mechanism is used as before. Each rocker arm operates a pair of valves by means of a guided bridge.

Piston Alterations—Two important changes involve a reduction in the piston's rim height and a reduction in the bowl volume. Comparative figures are shown. The low rim height helps scavenging because in conjunction with the porting changes it increases the time that the ports are open. The reduced breathing restriction helped in cutting the required blower horsepower requirements.

With the high air box pressure, possibility of leakage to the crankcase is increased. To avoid this, a 2-piece seal ring has been added to the piston skirt just above the oil control rings.

Water Pump Changes—The water circulating pump is driven from the blower and in the case of the 6-71T, one with greater capacity was needed to compensate for the reduced blower speed. No change was necessary for the





Top and bottom of part of the 4-valve cylinder head. At left, note the bridging for dual valve operation and offset injector necessary to clear the additional valves.

4071T engine because the same pump has been used on the 4 and 6-cyl engines.

Governor Changes—The governor also turns slower, being driven from the blower. Compensation was made by use of a lighter and more responsive high-speed spring.

Oil Cooler—The engine's lube oil also lubricates the turbocharger and at the higher engine outputs, the heat picked up by the oil is greater. A larger oil cooler is therefore used in place of the standard size to remove the additional heat.

Injector—The only change in the injectors involves the body; all other parts are the same as for the standard 60, 70, 80-cu mm high-valve designs. The new injector body is offset to clear the addtional valve springs.

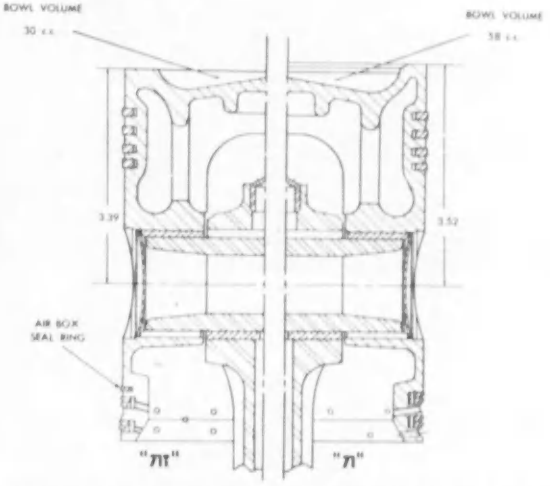
Summing Up

Turbocharging of these engines has produced important advantages. Performance curves show that the added air and the provisions for utilizing it well have resulted in increased output. At the same time a reduction in heat load on the engine parts was effected. Piston temperature was reduced up to 6-7%; exhaust temperature to the turbine up to 4%; and exhaust temperature from the turbine up to 18%.

Lower peak pressures (up to 4%) also result from this improved thermal efficiency. Combined with the low piston and exhaust temperatures, the latter having a bearing on valve life, there is every promise of increased durability despite the higher output.

Overall improvement in fuel utilization is shown in the performance curves and in the comparison chart. This is due to improvement in combustion due to turbulence, higher air/fuel ratios and better scavenging.

Altitude performance is improved by both the better combustion efficiency and the characteristic of turbochargers to speed up as air density decreases and hence maintain nearly normal air pressure. Also typical of



Direct comparison of standard and Turbopower piston designs. Lower rim height and new porting increase the scavenging time.

PERFORMANCE COMPARISON
6-71T WITH LARGE EXHAUST TURBINE
VS.
6-71 STANDARD WITH 80 CU. MM INJECTORS

	6-71	6-71T	PERCENT CHANGE
HP at 2300 RPM	244	280	15% Increase
LB/BHP-HR:			
Maximum Power	.495 @ 2300	.422 @ 2300	15% Decrease
Min. Full Thtl.	.476 @ 1800	.417 @ 2000	12% Decrease
Min. Part Load	.434 @ 1200-1400	.410 @ 1200-1400	5½% Decrease
Percent Change—Full Thtl. Fuel to Min. Fuel Pt. Load	12½%	4%	

Turbocharging not only improves specific fuel consumption but produces a flatter curve having less change with load.

HORSEPOWER OF 71T ENGINES AT VARIOUS ALTITUDES

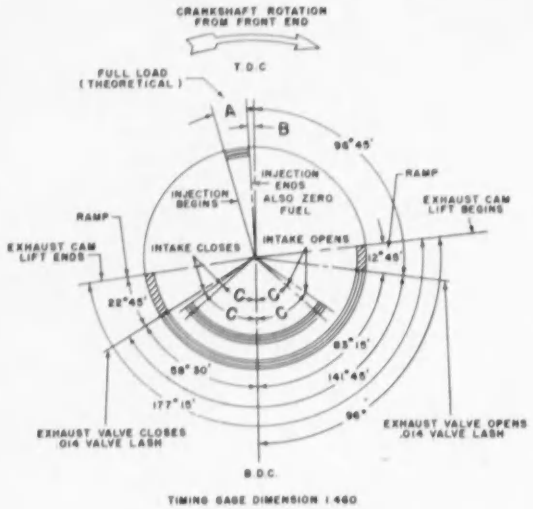
ALTITUDE	% RATED POWER		4-71		6-71
	2300	2100	2300	2100	2100
1,500	100	100	171	161	236
4,000	99	98.5	169	158	232
8,000	96	95	164	153	224
12,000	90.3	89	154	143	210

Turbocharging has improved altitude performance. Figures refer to rated hp of Turbopower engines.

turbocharged engine, the exhaust energy expended in the turbine has a marked silencing effect.

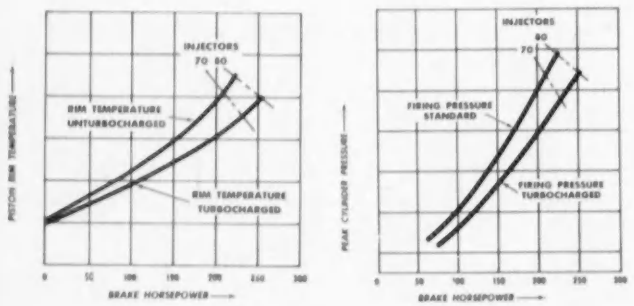
So here are four added starters in the horsepower sweepstakes and they're well worth watching.

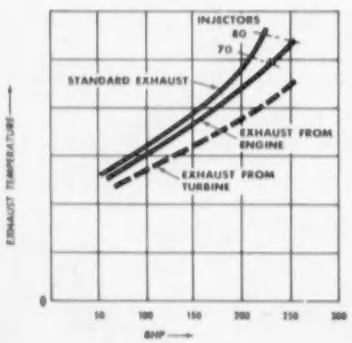
TIMING DIAGRAM



TIMING GAGE DIMENSION 1.460

		INJECTION TIMING		INTAKE PORT
		DURATION	END TO T.D.C.	TIMING
		A	B	C
8V-T INJECTOR	SERIES 71	18°	9°	49°
	SERIES 71T	15°	9°	55°





Typical reductions in piston rim and exhaust temperatures and the peak cylinder pressures. Actual reductions (in percentages) are given in the text on previous page.

TURBOCHARGERS FOR THE "71's"

By Carl Harms

Manager, Supercharger Dept.
Elliott Co., Jeannette, Pa.

TURBOCHARGERS on the Detroit Diesel "Turbopower" engines are the Elliott Company M-5 and M-10 models. They are very simple units—deceptively simple. It took a long time and concentrated engineering to produce these highly-efficient units.

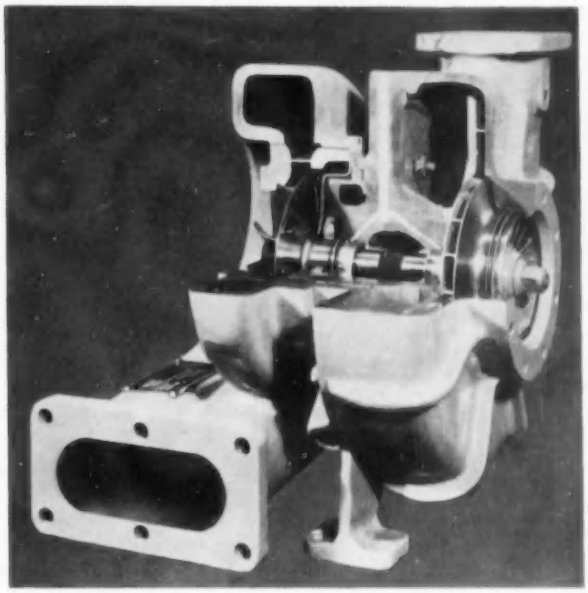
High efficiency is a natural goal. Its attainment not only improved 4-cycle engine turbocharging but extended the advantages of the technique to 2-cycle engines. It was a natural step.

Turbocharging of 4-cycle diesels started in this country in about 1932 but was slow to catch on until 1940. It was about this time that Elliott Company started to build units for low-speed engines in marine, stationary and locomotive service. Application was for engine outputs of 400-hp and upwards.

Today, the majority of medium and large 4-cycle engines are turbocharged. Elliott alone has built turbochargers for approximately 15-million diesel horsepower. Based on this experience in design and construction of these units, they considered designing and building turbochargers for smaller high-speed engines in normally-aspirated sizes from 100-hp up. This was back in 1947.

Various types of superchargers for smaller diesel engines were studied and tested. As a result, the gas turbine-driven centrifugal compressor, or turbocharger, was selected as most promising. Designs that subsequently evolved (about 1949) are now known as the M-5 and M-10 turbochargers.

Many tests were run, turbocharging different engines. Progress was gradual since it involved changes in the engines in order to utilize the full potential of turbocharging. At its best it gives a substantial net horse-



Details of the turbochargers used to increase the net horsepower while reducing the specific fuel consumption of Detroit Diesel's new line of Turbopower "71" engines.

power increase with an accompanying reduction in specific fuel consumption.

First applications were on 4-cycle engines. Typical of progress being made, in 1952 Cummins Engine Company built their race car using an engine equipped with an M-5 turbocharger. This race car qualified for the pole position at the Indianapolis Memorial Day race with the highest qualifying speed record up to that date.

A lot was learned in this "laboratory" but still acceptance of turbochargers for high-speed engines was quite gradual until 1954. Then it increased phenominally. Today there are thousands of high-speed turbocharged engines of many different makes (though all 4-cycle) in just about every service where diesels are used. Some in the more recent highway truck and tractor service have now over 150,000 miles of service; in other applications some M-5's have been in continuous operation about five years.

This is the apprenticeship served by the M-5's and M-10's. Continuous refinement and improvement has brought them to the point where they are now making the turbocharging of high-speed 2-cycle engines a reality. It is of interest to note that the turbochargers being supplied to Detroit Diesel are the same as those that for the past six years have been giving excellent operating records when applied to 4-cycle diesels. The only requirement for adapting them to 2-cycle engine design was proper application. Pressure ratio of these units is 1.7 to 1.

Turbocharger Construction

When you look at the turbocharger, it seems to be a simple machine. It is — in construction, operation and maintenance. But design is another story. The main component is a single-stage turbine wheel and single-stage centrifugal blower impeller mounted on a common shaft. It is surrounded by the necessary casings.

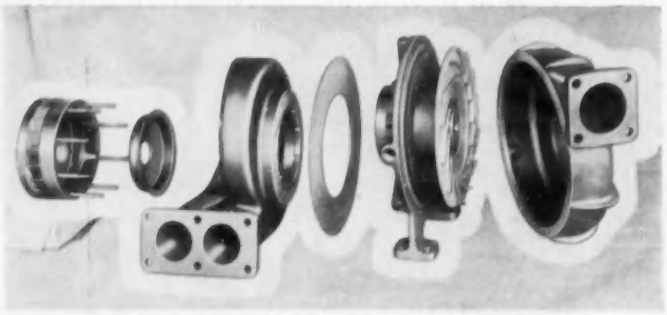
Exhaust gases enter a single-inlet casing surrounding the turbine. A nozzle ring arranged for full 360-deg admission directs the gases to the centripital turbine or expander wheel at the proper angle. Gases exit axially.

Both the exhaust casing and the nozzle ring are held by bolts to the intermediate casing. This component contains the rotor bearings, lubrication system for the bearings and water cooling system. The water cooling and also two radiation shields minimize heat transfer from the turbine end to the blower end.

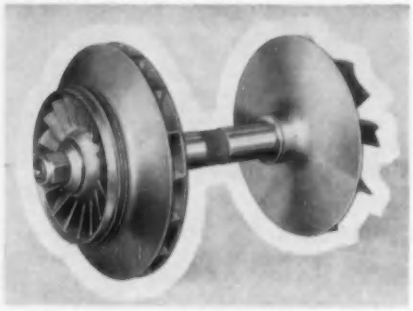
The inner radiation shield, clamped by the nozzle ring, is between the turbine wheel and the intermediate casing. The outer shield prevents external heat radiation between casings. Circulating water cools the turbine end of the intermediate casing.

Intake air flow enters axially and then is discharged radially through a diffuser into the blower casing. It leaves the casing through a single flanged outlet. The diffuser is pressed on shoulder of intermediate casing.

Materials are very important in view of the high-temperature operation at the turbine end. Casings are cast Meehanite; the nozzle ring is of special Ni-Resist with stainless steel blading cast in place; inner and outer radiation shields are of stainless steel; the turbine wheel is of a special heat-resistant alloy with necessarily high physical properties at elevated temperatures; and the blower impeller is an aluminum alloy casting.



Turbo parts from left to right are: nozzle ring; inner radiation shield; inlet casing (single inlet is used in models for Detroit Diesel); outer radiation shield; intermediate casing with diffuser; and blower casing.



Turbine wheel (right) and shaft are one assembly. Impeller (thrust collar behind) fits on shaft with light press, has drive key and is retained by nosepiece and nut.

With exhaust gases, air, water and oil, all of which must be kept separate, sealing was given careful attention. The water can be summarily dismissed as it has its own closed passages. Oil is kept from the casings by oil seals located just outboard of the rotor bearings. They are pressed into the intermediate casing. The one on the turbine end has a babbitt insert. Also, ample drain area eases the load on the seals.

Air leakage and exhaust gas leakage are primarily controlled by the relatively close running clearances of turbine and impeller in their casings. Labyrinth rings are machined on the impeller shroud to limit leakage of high-pressure discharge air between it and the casing. A small amount of blower discharge air is bled from the blower casing to affect turbine cooling. Air passes through drilled holes in the intermediate casing to the space behind the inner radiation shield. It can then flow up the back wall of the expander wheel to cool it, after which it mixes with the exhaust. This air also pressurizes the oil seals to prevent oil leakage.

The rotor assembly consists of the turbine wheel and shaft assembly, a thrust collar, the impeller, and a nose piece. The impeller is lightly pressed on the shaft and keyed as well. An elastic stop nut holds the nose piece, impeller and thrust collar against the shoulder on the shaft.

Rotor bearings are steel-backed, babbitt-lined sleeves pressed into the intermediate casings. They are line-bored to size, mating with the shaft for a proper close running clearance.

Lubricating System

The engine's lube oil system supplies oil for the turbocharger bearings. Full-flow and continuous filtering is used. A pressure of 30 to 40 psi gauge at full engine load is needed and the lag in pressure buildup after engine starting should not exceed 12 to 15 seconds.

Design conditions call for inlet oil temperatures in the 130° to 160°F range, not to exceed 180°F. Viscosity should run between 100 and 150 SSU and never go above 200 SSU. This defines that oils heavier than SAE 40 are not generally suitable.

Cooling System

Jacket water from the engine is used for cooling. If the engine builder's recommendations as to type and treatment of the cooling water are followed, they will be suitable for the turbocharger.

Water enters the intermediate casing cooling passages at an angle at the bottom and discharges at the top. To hold thermal distortion to a minimum the flow is arranged to permit a maximum of about a 30°F rise at full engine load. When clean soft water is used, the discharge temperature should not exceed 180°F. Under conditions where less favorable water must be used, lower temperatures may be advisable.

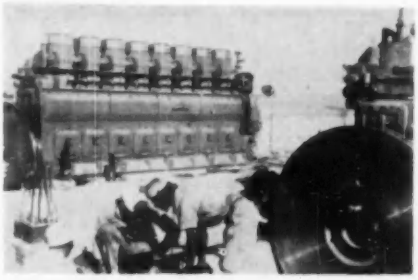
Summary

Turbochargers for the Detroit Diesel engines are backed by a long and successful apprenticeship gained in the 4-cycle engine field. The same units are used, the only design modifications being those of adaptation to the particular 2-cycle engine design.

Substantial gains in net horsepower and reduction in specific fuel consumption are the result. Operationally, the turbochargers contribute many inherent advantages. Independent of any mechanical connection to the engine, the turbine-centrifugal blower combination modulates intake air in response to load and thus provides more favorable air/fuel ratios over a broad operating range. The additional air also cools hot internal cylinder parts, a major factor in extending component life and reducing jacket heat rejection.

There is no complication of engine maintenance. Today's turbochargers are relatively trouble-free when normal treatment and routine inspections are accorded them. They're not prima donnas; they're a tough, rugged and simple mechanism, designed to do an effective job of supercharging.

Modern acceptance of turbochargers shows that the diesel industry is in a "turbocharging" phase. This bears testimony to the sound judgement used in the technical studies initiated by the Elliott Company in 1947 leading to the development of the smaller M-5 and M-10 turbochargers.



Arabian workmen locate exciter for generator set. Assembly was difficult because of constant fight against abrasive windblown sands that could have ruined these generator sets while in the open.

Two Enterprise diesels are surrounded by idle materials and equipment. Unit at left met its scheduled completion date and operated for nine months in the open before a structure was built around it.

Diesels Can Work Outdoors Too

Outdoor steam plants are being installed to lick building costs. There's talk about similar diesel plants. Here's how two diesel-generator sets performed (unexpectedly) under tough outdoor conditions.

DISCUSSION and planning of outdoor power plants have been intensified of late. The reason is an attempt to lick building costs. Many such steam turbine-driven generators have already been installed from Florida as far north as Canada. Numerous small high-speed diesel engines are also known to be operating in the open without protection of any kind.

The feasibility of "open-air design" diesel generator plants came in for an unexpected endorsement from Saudi Arabia. Two units intended for undercover service pulled through successfully when working in sandstorms and extreme heat. Apparently diesel power plants can take it under the worst outdoor conditions—even when not specially designed to meet them.

The unexpected outdoor test of these units took place when the construction of the Nasrieh power plant in Riyadh was unavoidably slowed for nearly a year. The plant was being built especially to provide power for Nasrieh Palace, home of Saud Ibn Abd Al-Aziz, now King of Saudi Arabia. The two units involved were Enterprise model DSQ-318 engines rated 1560 hp at 360 rpm driving 1375-kva Elliott generators.

These units were scheduled to go into operation six months apart, December 1952 and June 1953. Meeting the engine in-service dates proved to be the easiest part of the job.

The biggest hazard during this time was the characteristic windstorms, or "shamals", of Arabia. With these winds the fine desert sands entered every opening, corner, and pocket. This required constant cleanup of all equipment. To make matters worse, the weather was extremely hot.

To the credit of everyone concerned, the American-made diesels and their auxiliary equipment came through with flying colors. When inspected after 5500 hr of operation at 90% to 110% of full load, the first unit showed negligible cylinder liner wear, and about 0.002-in wear off the top piston ring. Also noteworthy was the performance of the Alco radiator-core type jacket water coolers. Despite the hot weather there was no trouble in maintaining engine operating temperatures within required limits.

Along with the Enterprise engines and Alco coolers the plant is equipped with two 1375-kva Elliott generators and 20-kw Elliott belt-driven exciter units. Ross 1011 CP lube oil coolers, Briggs JP4-D-V2 lube oil filters, Maxim 36 MUC exhaust silencers, and Vortox LB 50-16 oil bath air filters complete the major auxiliaries. Tuthill oil pumps and Ingersoll-Rand water pumps are also used.

As finally completed, the Nasrieh plant is a building structure having three main sections. The engine room consists of three bays each 25-ft wide and 75-ft long. (A third generator set will eventually be installed). A switchgear bay measures 9 x 55-ft and a storage shop area is 75 x 35-ft. The framing is reinforced concrete with a concrete roof. Walls are filled in with native stone cut on the site.

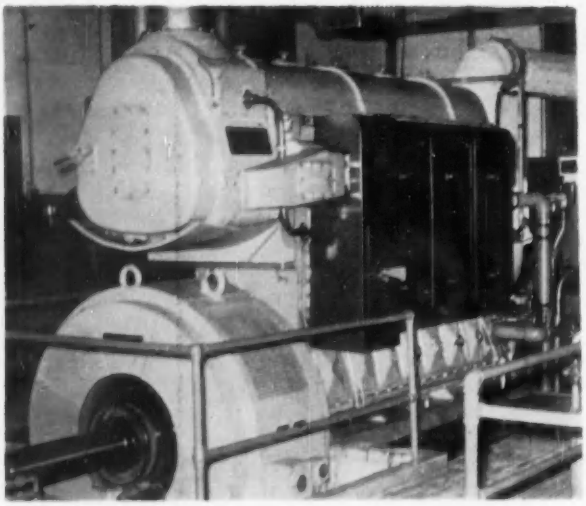


Fig. 1
This 6-cyl, 8⅛-in x 10-in, O-P dual-fuel engine driving an alternator in the Stockton, Kans., municipal plant was the first FM field conversion to spark ignition using the "jet-ignition" system. It served as the guinea pig in studying customer acceptance and durability of a spark-ignition engine using this new system. It was a success.

"Jet-Ignition" Fires O-P Gas Engines

Combustion system gives stabilized firing throughout entire load and speed range in high-compression, opposed-piston engines. There is no need for air modulation when natural gas or propane are used.

"JET-IGNITION" describes Fairbanks, Morse's new gas engine combustion system. It was developed for their opposed-piston, spark-fired engines.

By sparking a localized enriched charge of gas, ignition of lean air fuel mixtures in the cylinders is insured without air modulation at varying loads. This is a new approach to the old problem of operating a spark-ignition engine (hereafter referred to as "s-i") on a high-compression cycle.

The result is an engine with diesel compression ratio having high thermal efficiency and stable firing throughout the entire load and speed range. The controls are simple since engine governing with this system requires control of only the fuel as in diesel engines.

A paper describing this system and the background leading to its development was prepared by Messrs L. D. Thompson, R. H. Beadle and F. A. Blake, all of FM. This paper, presented at a recent ASME, OGP Conference by Mr. Blake, provides the basis for this article.

Background

In early gas engines the air/fuel mixture was adjusted more to meet ignition requirements than those of power. If they were leaned out to just meet the power demand, ignition tended to be unstable, particularly at part load. Compression ratios, hence thermal efficiency was limited since when the mixture reached its critical compression ratio it would detonate. Yet as gas prices went up, higher thermal efficiencies looked more and more attractive.

One answer was the dual-fuel engine. The leaner mixtures, suitable to meet load demands, could be compressed at diesel compression ratios without detonation. The problem of igniting the lean charge was solved by pilot oil injection. But now there was the problem of liquid fuel costs which in areas where gas was relatively inexpensive, offset the potential savings of the higher thermal efficiency.

Thus the object of FM's engineers was to develop an engine that would burn gas at diesel compression ratios, use only enough gas to meet load requirements, and ignite by a spark without any requirement for liquid fuel.

Naturally if an existing engine design could be modified to gain the above goal, both time and money would be saved. Years of experience with successful dual-fuel operation on the 8⅛-in x 10-in O-P engine, which uses natural gas as its major fuel, indicated that this was a natural starting point. So it was decided that a series of tests should be run to determine the feasibility of operating it as a high-compression, s-i engine.

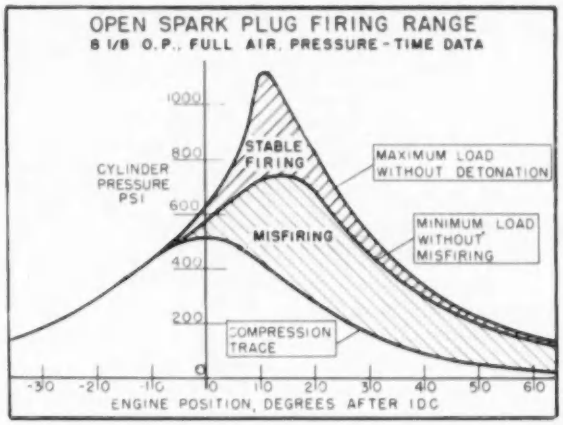


Fig. 2
Two top curves show limits within which spark-ignited combustion was regular without use of enriched localized charge that is used in "jet-ignition". Lean mixtures caused misfiring.

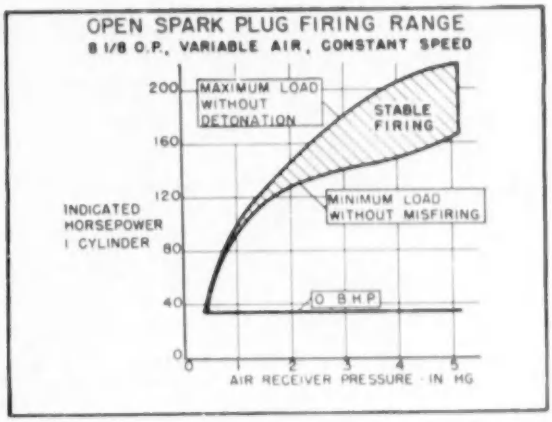


Fig. 3
Curves show maximum and minimum loads at different air box pressures in 8-1 cylinder not using "jet-ignition". Shaded area range must have air varied with load to get stable and safe firing.

S-I System Tests

The first step was to find what modifications were necessary. Nozzles of the dual-fuel engine were replaced with spark plugs and an electrical system was provided for a timed spark. Since the experimental engine was a 6-cyl, 960-hp unit using large quantities of gas, the tests were made on only one cylinder to prevent possible explosions.

Combustion Limit Test—Gas was admitted into this test cylinder only after the engine was started on five cylinders and ran at normal speed and temperature. The object was to determine the limits within which the spark-ignited combustion was regular. Fig. 2, shows the results as checked by a point-by-point pressure-time indicator.

The minimum load that could be carried without misfiring was first determined. This was done by increasing gas to the test cylinder until the expansion side of the indicator card was free of a no-fuel-cycle trace. A complete misfire shows a trace the same as a no-fuel cycle.

Maximum Load Test—To find the maximum load which the spark cylinder could handle, gas was increased until detonation occurred. Then gas was reduced slightly and another card taken. Regular firing occurred only in this narrow high-load band.

The cycle became erratic to the point of cutting out when gas pressure was reduced toward light load. This misfiring resulted from lean mixtures, not from a poor spark or other reason.

Variable Air Supply Tests—To determine maximum and minimum loads for various air pressures a bypass valve on the blower was adjusted to vary air pressure from 0.4 to 5.2 in hg. Curves in Fig. 3 show the maximum and minimum ihp obtained at various air box pressures. The shaded area indicates the horsepower range over which regular firing could be expected for various air quantities.

Regarding this, the authors said, "To put it another way, this area shows the range within which the air to the cylinder would have to be varied with the load to obtain regular and safe operation." Note how the stable firing range (Fig. 3) becomes narrower as the air and loads are reduced.

Later tests showed that once the engine was nursed through this light-load range to about 75% load, stable operation was obtained. But as the authors put it, "Getting the engine through the light-load range was no simple task".

Development of "Jet-Ignition" System

Tests showed a need for operation improvement. Two courses were open. Modulation of air would help, or some other method of getting better ignition of the lean mixtures had to be devised. The latter was a more attractive course.

In words of the authors, "The widened range would be more effective than even the most complex controls in eliminating misfiring, an item which is most desirable, to eliminate, due to the accumulation of raw gas in the exhaust system which usually follows".

Several methods were tried to help ignite lean mixtures. Included were such items as one or two plugs per cylinder, various plug designs, different piston-top contours and lower compression pressures. However, none of these worked. It was concluded that the triggering energy from a spark plug alone would not be enough to fire these very lean partial-load charges regularly.

FM engineers knew however that these lean mixtures are regularly and safely fired in dual-fuel engines by pilot oil which releases relatively large amounts of energy for ignition purposes. So it was decided to simulate this condition as closely as possible. This was done by using the spark for igniting only a small, protected and enriched localized charge.

The energy from this localized charge, being many times greater than from a spark alone, would ignite lean mixtures as pilot oil does in dual-fuel engines.

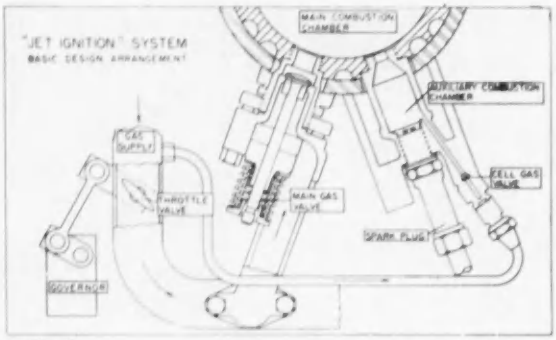


Fig. 4
Combustion of "cell" gas in auxiliary chamber blasts jet of flame through orifice into main chamber and ignites main charge.

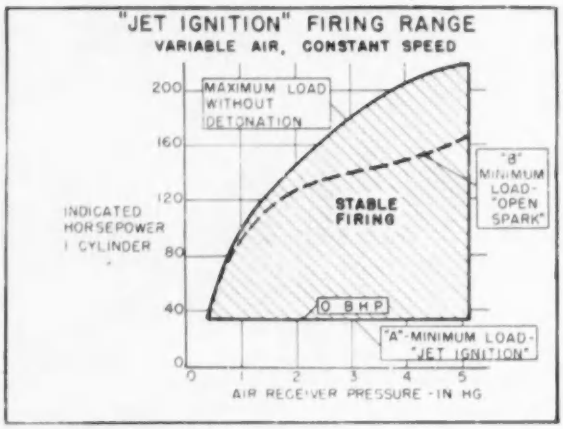


Fig. 5
Curve B (minimum load curve in Fig 3) is dropped to curve A, which is zero load, with no need for air/fuel mixture controls.

"Jet-Ignition" System Operation

Fig. 4 shows the basic design arrangement of what was to be the "jet-ignition" system. The main gas charge, throttle-controlled by the governor, is admitted to the combustion chamber through a poppet valve. A cam opens this valve for a controlled period early in the compression stroke.

An auxiliary chamber (containing a spark plug), has an additional gas supply which isn't varied by the governor. This is called "cell" gas and is maintained at constant pressure regardless of engine speed or load. The extra gas enters the auxiliary chamber through an automatic check valve. When cylinder pressures are low, during exhaust and scavenging, gas flows through the non-return valve to the small chamber containing the spark plug.

With this extra cell-gas arrangement the mixture surrounding the plug can be enriched to as much as 14 to 1 since this is the cylinder's trapped-volume compression ratio. The authors pointed out that, "An air-gas mixture of 14:1 is certainly too rich a charge for these high compression engines to handle without auto-ignition prior to the spark." Yet by proper sizing of the flow passages in the cell supply line you can get mixtures surrounding the plug rich enough for positive ignition at all throttle requirements.

The readily-ignitable charge in the auxiliary chamber is fired by a spark. The combustion which follows in the auxiliary chamber blasts a jet of flame through the orifice into the main chamber and ignites the main charge. This results in consistent and regular ignition throughout the entire speed and load range when using diesel compression ratios. Controls for varying the air supply to improve part-load efficiency are optional but are not required to eliminate misfiring or erratic operation.

Fig. 5, shows the result of widening the stable combustion range. Here the open-spark load curve B has been dropped to curve A which represents zero load. With such a widened combustion range there's no need for automatic air/fuel mixture controls.

Refinement experiments on "jet-ignition" components determined effects of variable cell volume, orifice areas and quantities of cell gas. One outcome of these tests was elimination of the cell gas requirement in one size of engine. It was also found that engine speed range affects ignitibility—extra cell gas is definitely required in the smaller higher-speed, 5¼-in x 7¼-in, 1200-rpm, O-P engines.

Electrical System

The authors commented that, "All of the interesting problems were not confined to the jet phase of the development. The electrical system for sparking a 500-psi charge demanded its fair share of attention." And they continued, "The spark plug itself presented some problems."

In general the basic electrical system features low-tension distribution. Individual coils are located at each cylinder near the plugs to permit short high-tension leads, shielded to prevent external shorting.

Although low-tension magnetos, battery breaker-point systems and pulse generators all gave sufficient spark, present production engines use pulse generators because of simplicity and durability. However the authors observed, ". . . . new developments in the low-tension magneto field will in the future provide good healthy competition for the pulse generator."

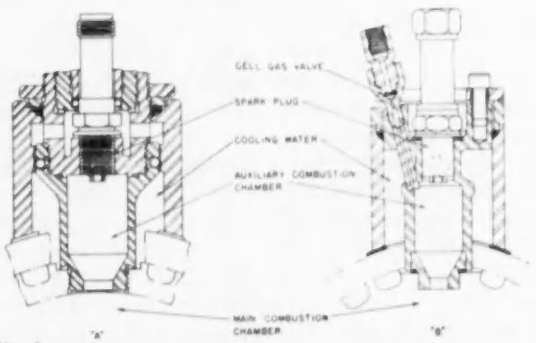


Fig. 6
At right spark plug is kept cool in "jet-ignition" system by modifying cell design to allow for more water jacket area.

As for the spark plug, the problem was in keeping it from getting too hot. This was solved by leaning the mixture in the cell and modifying the cell design for better cooling of the plug.

Field Installations

After these various problems had been overcome in the laboratory test-engine, the next step was to move into the field for studying customer acceptance and durability. Arrangements were made to apply "jet-ignition" to a 6-cyl, 8⅛-in x 10-in, O-P, dual-fuel engine in the Stockton, Kans., municipal plant.

Since its conversion to spark ignition in Sept., 1952, this engine has logged over 19,000 hr in very exacting a-c service—operating over wide load ranges, yet maintaining necessarily accurate speed regulation. During this period the maintenance interval for the Champion R115 spark plugs used was 1800 to 2400 hr. Since these plugs could be regapped twice, their life was more than 5000 hr.

The American Bosch pulse generator and high voltage transformers were trouble free throughout this entire period.

According to the authors this installation showed 19% less fuel cost than when operating on dual-fuel using pilot oil for ignition.

Several other 8⅛-in x 10-in, O-P spark models have been installed in various municipal generating plants. All are operating satisfactorily said the authors. The first of these new production installations logged over 7500 hr in 11 months.

The first 5¼-in x 7¼-in, spark-fired, O-P engine now in oil-field-drilling service for about 7500 hr, has completed its 16th hole ranging from 7000 to 8000-ft deep. This rig operates either on propane or natural gas.

Propane Operation

In areas where gas is readily available it's no longer necessary to use both pilot oil and gas fuels to keep the high efficiencies afforded by diesel compression ratios. Even when the gas supply is interrupted temporarily propane can be used as a standby-fuel. Many dual-fuel installations now pay through the nose for this fuel oil required for pilot ignition to guard against gas interruptions averaging about 2 days a year.

When changing over to use propane there's no need to modify the engine in any way. However, because of the difference in heat value of these gases, a manually-adjustable pressure regulating valve in the small line connecting to the cell-gas valve in the cylinder (not shown in Fig. 4) is reset to reduce the quantity of cell gas used to ignite the main gas charge.

In conclusion, the authors commented, ". . . ." jet-ignition's already established fine performance with propane makes it feasible to consider spark-fired, high-compression gas engines for mobile equipment such as switching locomotives, towboats, etc."

Artificial Muscles Save Time For Construction Contractor

MAINTENANCE is big business for a contractor. For this reason, contractors in general have long been pioneers in using power tools to speed construction and limit labor costs. They do the job more efficiently, and more economically.

It was natural then for the Central Pennsylvania Quarry, Stripping and Construction Co. to turn to power tools as one answer to its diesel maintenance problems. The company has equipped its mechanics with seven electric and air-operated Ingersoll-Rand Impactools for use in the field as well as in the shop. Since their introduction, the mechanic's time has been spent on jobs requiring his skill; not his muscle.

The company is interested in the labor savings; but even more so in the reduction in downtime for trucks, bulldozers, shovels, and in the increased availability of the equipment.

Aside from its many uses in the field, the shop's 35 mechanics keep the Impactools busy on conventional jobs. Ten 35-ton Euclid trucks, powered with twin-diesel engines, plus 20 dump vehicles keep at least two tools going all the time. They are busy removing nuts from engine and transmission components, and changing the big, dual tires on trucks as large as 40 tons.

This phase is worthy of mention. Mechanics changing tires on the 22-ton Euclid dump trucks found that by using the air-operated Impactool they could change two big, dual wheels in the same time it usually took to change one with a hand wrench. And on other operations, such as replacing the bottom plate on one of the larger buckets, the thought of using a hand wrench on a job of this size is so forbidding that no one has ever attempted it.

Introduction of the Torque Control Impactool should add to the versatility of the power tools. It will run a nut to any pre-set torque, and then automatically shut off. Mounting cylinder heads, and the other jobs having specific tightness requirements, should be accomplished much faster.

Central Penn's successful use of power tools has increased the availability of equipment. In addition to speeding construction, it has helped solve a serious maintenance problem. Despite a continuously rising wage scale, labor costs have been held to a minimum.

Two-Fuel System for Locomotives

Review of tests performed by Southern Pacific to reduce costs. They show that less costly fuels can be used successfully in locomotive diesels when operating under higher loads. Implications are that this two-fuel system, properly used, can be extended to diesel applications other than railroads.

A dual-fuel system for diesel locomotives is now in use. Developed after two years of experimenting by Southern Pacific, this system permits part-time use of heavier, less costly fuels.

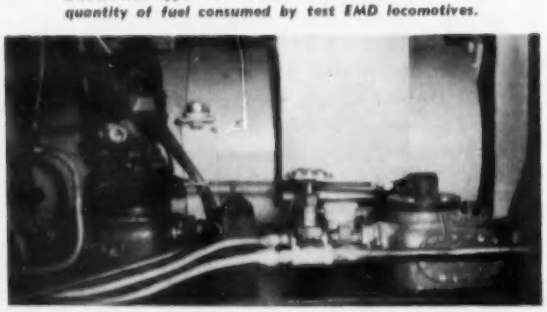
Although great savings in fuel costs is the essential reason for the use of a dual-fuel system there is another important aspect. Use of lower quality fuels releases highly refined products for processing as jet fuels and gasolines—a particularly desirable condition in times of national emergency.

Paul V. Garin, engineer of research and mechanical standards for Southern Pacific, conducted the experiments under the direction of Stanley M. Houston, the railroad's general superintendent of motive power. Mr. Garin describes the new system as a "proven success".

Nineteen main-line freight locomotives have been equipped with the dual-fuel system to date while extensive testing has gone on. Fifty additional locomotives are being adapted for the system as they are shopped so that fleet-tests may be made.

The problem now facing all railroads is to determine which one or more of these lower grade, so called "economy fuels" available in their supply area, can be used without getting into too much increased maintenance and repair costs, or troublesome operating problems.

Differential-type fuel meter used to measure the quantity of fuel consumed by test EMD locomotives.



In a talk before the Pacific Railway Club recently, Mr. Garin, told what his railroad has done along these lines. Fully realizing the present and possible future needs, the Southern Pacific entered into a research program on diesel fuels with several major West Coast oil companies. These were in a good position to offer less critical fuels for consideration. The problem is of mutual interest: to the Railroads because of a lower price fuel; to the oil companies because it enables them to dispose of products which permit a better balance of their refinery outputs.

Southern Pacific engineers were determined not to be influenced by established fact. Their attitude was one of "let's find out for ourselves", and they felt that, "one test is worth a thousand expert opinions".

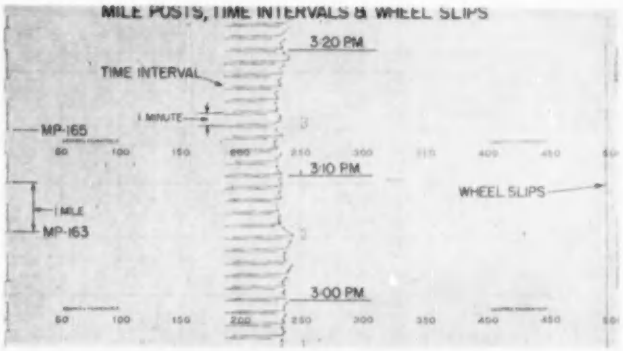
Tests were conducted on EMD diesel locomotive units in freight service between Roseville, California, and Sparks, Nevada. This is a distance of 136 miles through mountainous territory, with ascending grades eastward from Roseville for 85 miles to Norden—the summit at 6891 feet elevation, then down grade for 51 miles to Sparks. This run in either direction is excellent for experimental purposes because of the sustained operation at full throttle followed by long periods of idling.

Experimental fuels were designated in a series starting with X-1 down to the currently used X-6 fuel.

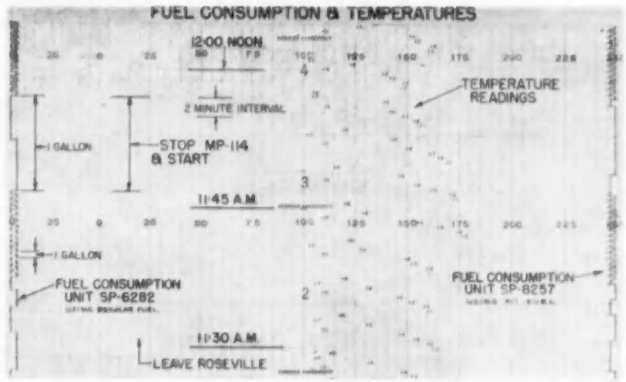
X-1 Fuel Test

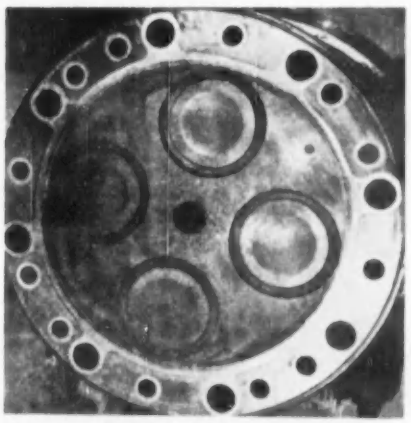
This was an all distillate product of a waxy nature. It has a high pour point of 55°F, a viscosity of 72 SSU at 100°F which is about double that of the normal distillate fuel and a sulphur content of about 0.90%.

Because of the high viscosity and pour point of X-1 fuel it was necessary to install a heat exchanger through which the engine cooling water was passed to heat the fuel to about 150°F. A pump was installed to circulate fuel oil from the tank through the heater and back to



Converted temperature recorders transcribed data on wheel slips, mile posts, time intervals and various temperatures. Fuel consumption from two units recorded simultaneously, one using regular fuel and the other using X-1 fuel. Gallonage indicators are close together at full throttle; but spread out at the idle.





Piston from SP-6357 and cylinder head from SP-8257 after six month test, using 100,000-gal X-1 fuel.

tank to maintain adequate temperature within the tank for pumpability.

Filtration trouble was anticipated and encountered with X-1 fuel. This was solved by installing a larger filter thus increasing the capacity of the filtration system enough to meet the requirements of this fuel. This larger filter uses a standard lube oil stock-type element.

A special differential-type fuel meter (Fig. 1) was used to measure the fuel consumed. This was necessary because of the fuel system on EMD units used in the test. The amount of fuel returned to the tank measured by an outlet meter was automatically subtracted from the amount of fuel passing through the inlet meter. A linkage in the differential meter between inlet and outlet portions gave a net consumption reading. This arrangement worked successfully.

A small emergency fuel tank was installed in the engine room of a test unit. It contained straight run distillate fuel for use prior to engine shutdown. This would avoid having the high pour point X-1 fuel cool off and solidify in the system. Fortunately it wasn't necessary to use this emergency fuel during the test.

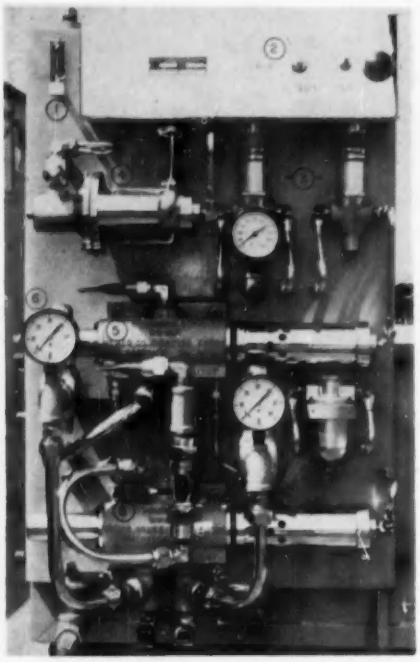
Fuel consumption, wheel slips, mile posts, time intervals and various temperatures were taken with converted temperatures recorders. These records (Fig. 2) were valuable in analyzing test run data. Fuel consumption was recorded simultaneously from two units; that of the unit SP-6282 operating on regular fuel (shown on left edge of chart in Fig. 3) and that of unit SP-8257 operating on X-1 fuel (shown on right edge of same chart). Note how gallonage indications come close together when the engine is working at full throttle and spread out when engine is idling.

During the X-1 fuel test, excessive sparking from the stack resulted in the test being abandoned temporarily. Analysis of exhaust port deposits showed that the lead base additive used in the fuel through a catalytic action was the cause of the trouble. Actually the additive was doing the job for which it was intended. It was removing the port deposits by lowering the ignition temperature of the soot so that it was being burned off. But the particles going out the exhaust remained incandescent for quite a while after being thrown from stack.

The X-1 tests were continued for a period of six months in units SP-6357 and SP-8257. At the end of this time, after each unit had consumed about 100,000 gal of X-1 fuel, the test was ended and parts examined. Typical conditions are shown of cylinder head face (Fig. 4) with exhaust valves in place, piston head (Fig. 5) and piston (Fig. 6).

Pistons from unit SP-6357 which operated on a higher additive lube oil were somewhat cleaner than those from

Piston removed after six months of running on X-1 fuel. The rings and ring grooves are in fair condition.



Fuel selector panel including solenoids (3) to actuate the inlet (8) and the return (5) selector valves.

unit SP-8257 which operated on a normal additive level oil. Condition of exhaust valves on each unit were considered normal and comparable.

In-as-much as the X-1 fuel did not offer a price advantage over the regular distillate fuel the test was concluded and the engineering data filed for future reference. This test, however, did prove that a high pour point waxy distillate with double the normal viscosity could be satisfactorily used in EMD diesel locomotives.

X-2 Fuel Test

This fuel was an all-cracked distillate of normal characteristics except for a low cetane value of about 34 and a lower gravity of 24 API. The higher heat units per gallon of the lower gravity fuel made it interesting as it was expected that this would result in a savings in fuel cost per unit of power developed.

To verify this, two tests were selected, SP-6282 to operate on regular fuel and SP-8182 to use X-2 fuel. The power developed during the round trip from Roseville to Sparks was practically the same for each unit. But there was a marked reduction in fuel consumption on unit SP-8182 using X-2 lower gravity fuel. Both units were adjusted to exactly the same horsepower prior to the test.

This series of test runs demonstrated that lower gravity fuel actually does produce a fuel saving in actual service because of its higher volumetric heat content.

Summarized data of these runs shows fuel to power ratios and percentage savings—the latter about 3%. Tests were also made with the fuels reversed in the two units to eliminate variables between them. The savings shown under these conditions were slightly smaller. This was attributed to the intermixing of fuels in the tanks of the two units as the tanks were not flushed when the fuels were reversed.

X-3 Fuels Adopted For General Use

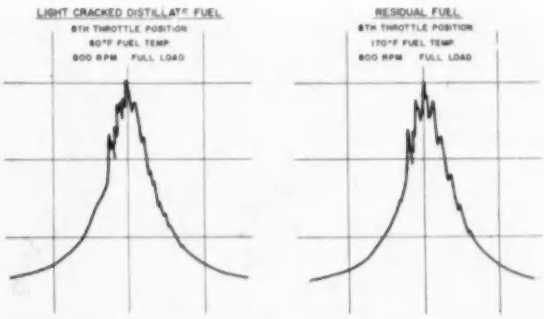
Fuels thus designated are in most cases a blend of straight run and cracked distillates. These have been the principal diesel fuels of the Southern Pacific Company, Pacific Lines, since April 1954, for all diesel locomotives except those which are supplied by tank wagon delivery at outlying points.

Dual-Fuel System Research

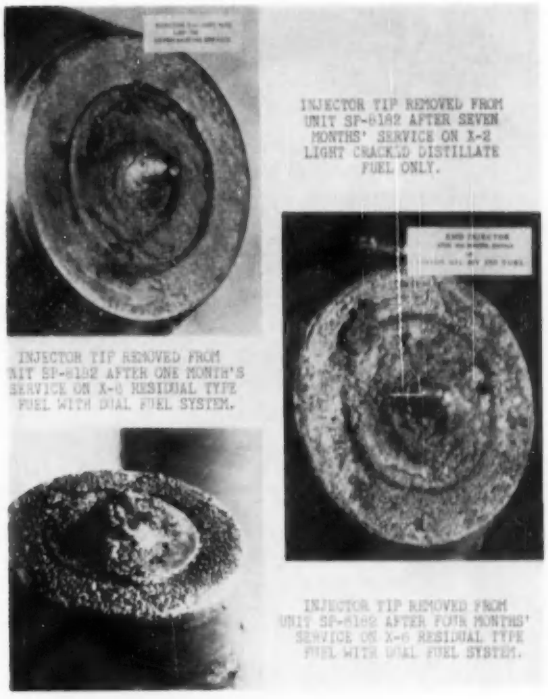
Having established the feasibility of using cracked distillates, the next logical step was to find out which of the more economical fuels could be considered for locomotive use.

There has been extensive background for use of residual type fuels on engines in marine and stationary service. These engines generally are of larger bore, operate at lower speeds and at constant output for extended periods of time. Locomotive diesels are of different design. They operate at variable speeds and outputs and at higher full speeds. Space aboard the diesel unit for special equipment is limited.

A dual-fuel system for the diesel locomotive was suggested through the knowledge that many of the characteristics of conventional diesel fuels are based on properties required for idling and low output operations. Fuel consumption under these conditions actually is a small percentage of the total amount used. At higher outputs the diesel engine can readily digest fuels having considerably less critical properties than those required for good starting and idling characteristics.



Pressure diagrams taken at 8th throttle position comparing distillate fuel to X-6 at 170°F. Both used standard injection equipment.


INJECTOR TIP REMOVED FROM UNIT SP-8182 AFTER SEVEN MONTHS' SERVICE ON X-2 LIGHT CRACKED DISTILLATE FUEL ONLY.
INJECTOR TIP REMOVED FROM UNIT SP-8182 AFTER ONE MONTH'S SERVICE ON X-6 RESIDUAL TYPE FUEL WITH DUAL FUEL SYSTEM.
INJECTOR TIP REMOVED FROM UNIT SP-8182 AFTER FOUR MONTHS' SERVICE ON X-6 RESIDUAL TYPE FUEL WITH DUAL FUEL SYSTEM.

X-6 Fuel Tested In A Dual-Fuel System

This was a test of a dual-fuel system in which a distillate fuel was used for starting, idling, and lower outputs, and then switching automatically to a heavier fuel (X-6) for higher outputs.

The X-6 fuel selected was decided upon by the maximum viscosity which could be reduced (by cooling water heat exchanger) to a viscosity suitable for injection. The viscosity arrived at was about 300 SSU at 100°F, which corresponded roughly to the fuel generally known as Navy Special Fuel. This fuel when heated to about 160°F by the cooling water has a terminal viscosity of about 80 SSU at the injector. This viscosity at the injector is considerably higher than that of normal distillate fuel. But it seems to work very well at the higher engine outputs.

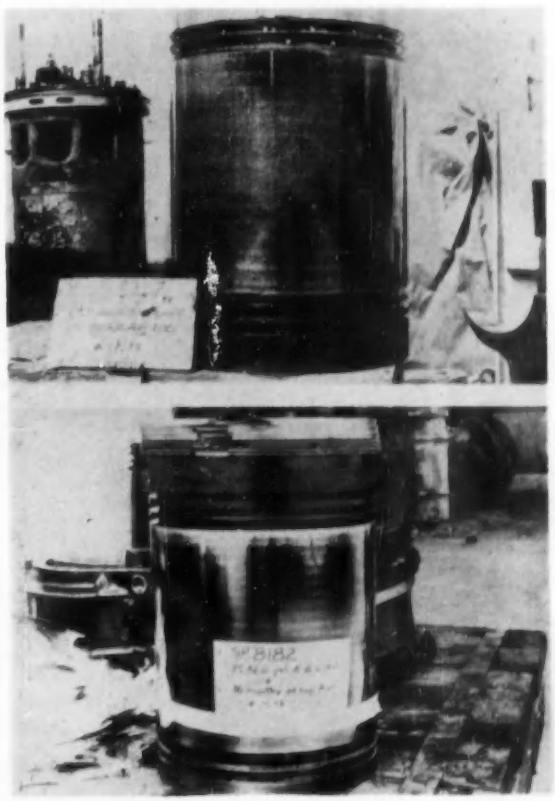
The X-6 fuel selected has a higher sulphur content of approximately 2.5%. But it was felt that the detrimental effect of high sulphur content would be minimized since the fuel was to be used only at higher outputs when engine conditions were such that condensation problems would not be encountered.

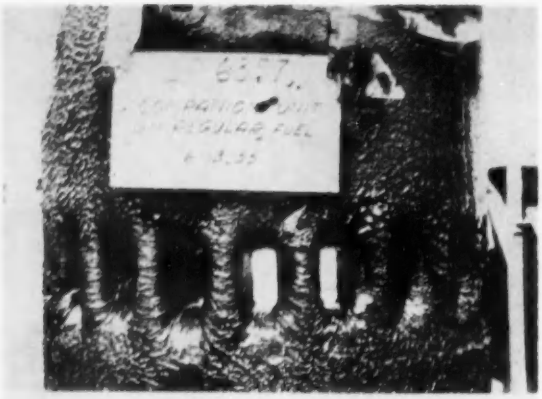
At the outset of the X-6 fuel test it was proven conclusively that locomotive diesels as presently designed and in service couldn't idle satisfactorily on this type of fuel. An attempt to idle the test unit on X-6 residual type fuel resulted in the engine becoming fouled in a very short time. This confirmed a belief that if a residual type fuel like X-6 was to be used on EMD engines it must be handled by a dual-fuel system.

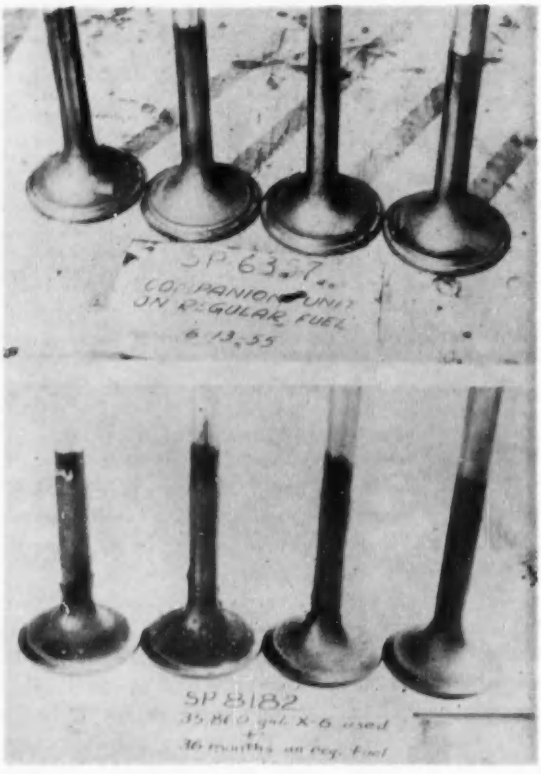
Dual-fuel equipment developed, in addition to the fuel selector (described later), consists of two arrangements. The package type fuel installation originally developed for utilizing X-6 fuel and in current use on SP-8257, consists of three component parts. These are an auxiliary fuel tank, heat exchanger and filter unit, and the fuel selector panel. The distillate system is the same as the normal fuel arrangement on the locomotive except that a relief valve is provided to return the distillate fuel to its tank when it is not being used. A supply of X-6 is carried in the main fuel tank.

In a second type of installation, now on unit SP-8182,

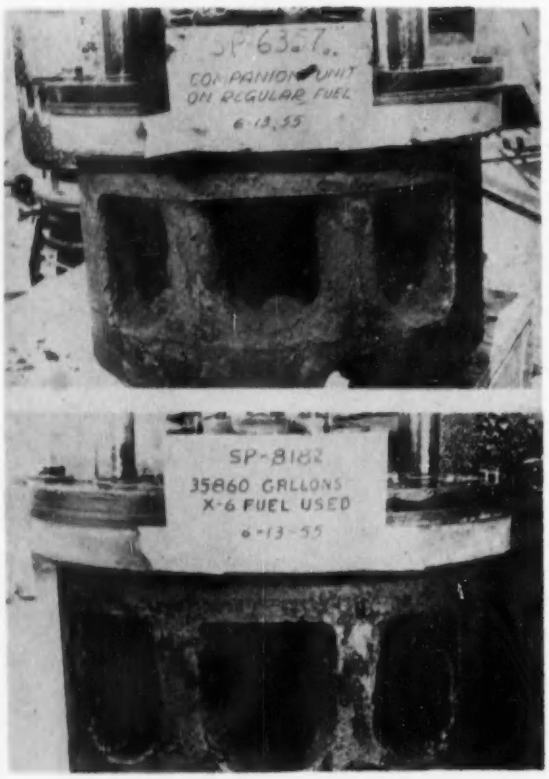
Pistons after removal from two test engines. Top piston from engine using X-3 light cracked distillate; lower piston from engine using X-6 residual-type fuel in a two fuel system.







Exhaust valves removed from same two engines



Top left.
Comparison of air-intake ports from companion engines. Top liner from engine using X-3 light cracked distillate fuel, lower using X-6 residual type fuel in two fuel system.

A comparison of the exhaust ports in heads removed from the two test engines.

the main under body tank is divided into two compartments. One compartment for 400-gal of distillate fuel and the other of 1100-gal capacity for the X-6. The main fuel storage tank is insulated with about ¼-in mastic-type spray-on coating.

Fig. 7 shows the fuel selector panel equipment, including: an inlet selector valve (8); a return fuel selector valve (5); and solenoids (3) to actuate these valves; the heat exchanger—with primary filter using a standard sock-type element; and a secondary filter having a resin-impregnated paper element, both immersed in the heat exchanger medium.

A feature of the installation is a circulating system for taking fuel from the main tank, passing it through the heat exchanger and returning it to the tank. This serves to maintain an adequate temperature within the

storage tank. The selector valves are of the spool type and are always open to one fuel or the other. An indicating lamp shows when engine is operating on X-6 fuel.

The entire mechanism is controlled by the governor relay which comes in between the 4th and 5th throttle positions. When the throttle is opened to the 5th notch the system is activated. There is a time delay mechanism on the changeover from distillate to residual fuel so that the fuel system does not switch over during movements about yards. A time delay also acts on the return fuel selector to prevent contamination of the distillate fuel tank with residual fuel when reducing throttle position. The entire system is electrically actuated and air operated.

Fig. 8 shows a pressure diagram taken with distillate fuel at 8th throttle position as compared to X-6 fuel heated to 170°F. at the same throttle position. These diagrams were taken with standard injection equipment in both cases. The two pressure diagrams are very similar, both in relation to peak pressure and rate of pressure rise. Anticipated problems, from excessive pressure and rates of pressure rise with heavy fuel when used through the same injector system as the distillate fuel, failed to develop.

Smoke traces with both distillate and residual type fuels at full throttle positions were practically the same, about "4" on the Bacharach scale.

Injector spray tip trouble with residual type fuel was not experienced as anticipated. Look at the injector tips in Fig. 9. Top view shows a spray tip after seven months operation on X-2 fuel. Middle view shows a tip after one month operation with X-6 fuel. While the deposits are heavier on the latter, the injector was functioning properly and was in normal condition. The lower view shows a tip after four months operation on X-6 fuel, still in satisfactory condition.

Deposit accumulation on the tip seems to reach an equilibrium and doesn't become more severe after extended service. Alternate operation on residual and distillate fuels with the dual-fuel system may be beneficial in cleaning the tips and in keeping the fuel system purged.

Figs. 10-13 show the condition of parts from unit operating on distillate fuel compared to similar assemblies from the test unit operating on X-6 residual fuel. All these parts were reported to be in satisfactory condition.

Test unit SP-8182 from which these typical parts were removed has continued in dual-fuel service and has burned about 100,000-gal of X-6 fuel. This unit has been in regular service over the main line between Roseville and Sparks.

Conclusion

According to Mr. Garin it must be realized that the use of fuels with less restrictive requirements can be expected to influence operating and maintenance problems. You can't expect to get something for nothing. However, the problem must be approached from the standpoint of overall railroad operating economies. It's the net saving that can be realized from the use of less critical fuels that should be looked for. Locomotive diesel engines will cooperate if given half a chance.

Successful continuation of such a program calls for cooperation by all concerned including the research, operating and maintenance forces of the railroads, engine builders, and oil suppliers. In the words of Mr. Garin, "I am certain that any problems involved in the utilization of these less critical fuels can be resolved by such a cooperative effort and that savings of mutual benefit to all concerned can be realized".

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 89 to check them.

1. Comparison of equivalent turbocharged and non-turbocharged diesels show that the turbocharged engine's fuel consumption is:
   a. Higher than non-turbocharged engines.
   b. About the same as non-turbocharged engines.
   c. Lower than non-turbocharged engines.

2. Turbochargers provide a more even air/fuel ratio throughout the engine's load and speed range than do mechanical blowers because the turbo's output is sensitive to:
   a. Engine rpm changes rather than load changes.
   b. Load changes rather than engine rpm changes.
   c. Both load and engine speed changes.

3. When turbocharging diesel engines it is possible to reduce the heat load on engine parts and have lower peak pressures while increasing engine output.
   a. True b. False

4. Most hydraulic governor manufacturers recommend that solvents or kerosene never be used to flush their governors.
   a. True b. False

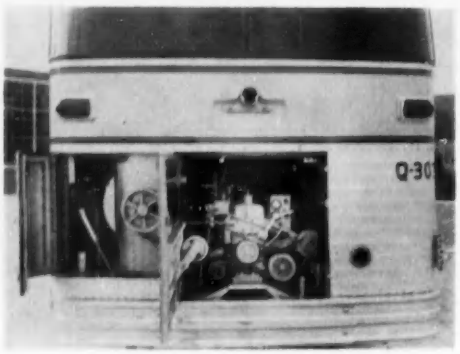
5. One design problem in getting high compression spark-ignition gas engines to operate at part load without excessively rich air/fuel mixtures is:
   a. Excessive knocking at full load.
   b. Modulation of air at varying loads.
   c. Misfiring at low loads.

6. In early gas engines the air/fuel mixture was adjusted more to meet:
   a. Ignition requirements than those of power.
   b. Power requirements than those of ignition.
   c. Economy requirements.

7. At higher outputs the diesel can more readily digest fuels having considerably poorer properties than when starting or operating at low and part loads.
   a. True b. False

Beck 41-passenger coach, featuring independently powered air-conditioner. Unit is located in compartment just forward of left-rear wheels.

Rear of coach with engine compartment exposed. All the power from Cummins JT-6-B Turbodiesel goes into drive. Left-compartment contains Beck Sirocco cooling system.



New Bus Has "Drive" and "Auxiliary" Power

Separate diesel engines, one turbocharged for high road performance, the second providing for air-conditioning comfort, are features of "Semi" Deck and Half Coach.

"PASSENGER-APPEAL" has become a by-word with Queen City Trailways, operating from Charlotte, N. C. Since the new "Semi" Deck and Half coach has been placed in operation, more and more comments are being heard from pleased passengers.

New luxury appointments have been manufactured into the coach by C. D. Beck and Co. The first thing to catch the eye is the modern lines of the vehicle itself. "Air-glide" air-suspension ride, which supports the coach on air rather than springs, provides a smooth ride. Well appointed interior includes ultra-modern foam-rubber reclining seats, and of course the comfort of air-conditioning for summer operation. Exceptionally large tinted windows provide excellent visibility.

But greater comfort and convenience demands greater power. Instead of draining horsepower from the drive engine, the bus is equipped with two diesels. A Cummins engine drives the coach, while the smaller continental engine supplies the power for the air-conditioner. All the power of the main engine goes into locomotion, none being consumed by heavy accessories. This contributes to fuel economy as well as lowering operating and maintenance costs, plus better performance and good roadability.

Cummins JT-6-B Turbodiesel develops 175-hp at 2500-rpm. A maximum of 405-lb ft torque is reached at 1800-rpm. With drive through the 4-speed Fuller transmission, the bus reaches a top speed of 65-mph.

The Beck Sirocco system is an outstanding and patented development in rear engine cooling. Thermostatically-controlled cooling water is circulated through a heavy-duty tube-type radiator core located in the left side of the coach. Air is drawn through this core by two Sirocco type fans which exhaust into engine compartment. Warm air is dissipated through a grille at rear of coach. In addition to being noiseless, the system absorbs less horsepower and insures cooling under all temperature conditions.

The smaller Continental XD-129 diesel engine develops 30-hp. It supplies power for the Tropic Aire unit which heats, ventilates and air-conditions. Both components are located in a compartment that opens from the left side. A grille allows air to pass through the cooling radiator.

This is the first of 41 new-design coaches ordered by Queen City Trailways. The remainder will be delivered and placed in service as they are completed.

Farris-Pickering's New Governor

Features of construction, operation and care of a new hydraulic governor are discussed.

Type 3300 Farris-Pickering hydraulic governor is adaptable to diesel engines for practically all industrial applications. It has a working capacity of 123 in lb.

FARRIS-PICKERING has a new hydraulic governor. This new governor, Type 3300, fills the gap in handling applications too large for their Type 3200 and too small for the Type 3700. This new model is not just an intermediate size patterned after the earlier units. While maintaining the time-proven ruggedness of these older models the new governor has been simplified, streamlined and made more sensitive.

Type 3300 Governor Features

In addition to designing for increased simplicity, sensitivity and ruggedness, adaptability to engines used in practically all industrial applications, both constant and variable-speed service, has been emphasized.

Simplicity has been achieved both in its external and internal construction. By redesigning the internal linkage of previous models the new governor has less moving parts and fewer pivot points. In addition, most oil passages have been cast into the governor housing casting. This simplified construction permits easy assembly and maintenance with no special tools required.

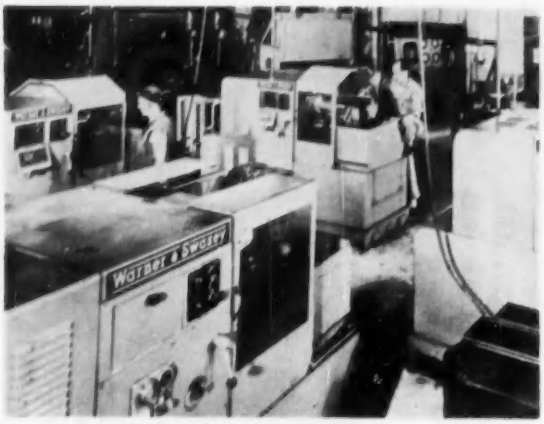
Tolerances in the governor are necessarily close to get a high degree of sensitivity. Precision has been maintained although the manufacturer has incorporated many simple inexpensive hardware parts which if necessary could be bought from a local source, without having to go to the factory. All individual parts, in addition to the assembly units shown, are interchangeable in the field to meet varying operating conditions.

Because these parts and assemblies can be so readily interchanged both at the factory and in the field, and without handfitting, conversion, replacement or repair costs are extremely low according to Farris engineers.

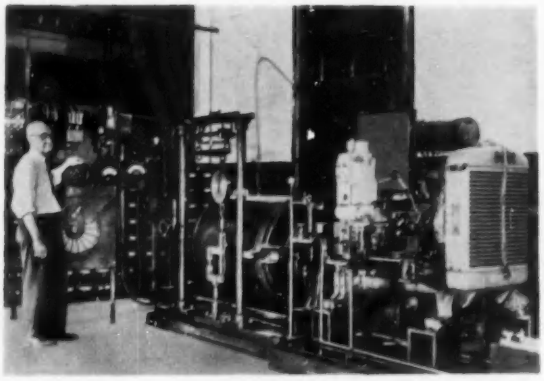
For example the same governor can be used for all applications with only some quick minor changes. To convert from constant speed to variable speed all that is necessary is to replace a sub-assembly plus minor internal changes. This can be done in the field by ordinary maintenance personnel. In the words of chief engineer C. G. Weber and governor specialist E. P. Massardo, "We're about the only major governor manufacturer that can do this."

Another advantage of the simplicity of this conversion is that customers using the Type 3300 governor for various applications need stock only a small number of parts.

Ruggedness—In the Farris-Pickering line of governors, the Type 3300 takes over on applications for which the 3200 is too small and the 3700 is too large. Its rated work capacity is 123 in lb and rated torque is 159 lb in.



Some of the Warner & Swasey automatics which make it possible to make precision governor parts as well as other Farris products.



This 4-cyl Minneapolis Moline engine driving a General Electric dynamometer, tests every governor which leaves the shop by accurately simulating operation of the governor in the field.

Despite design simplification its designers expect it to be as long lived as earlier models. Maintenance is simplified and is expected to be lessened.

This bright outlook is based on several constructional improvements. The new governor has ball bearings and sleeve bearings with greater area than before, decreasing unit load and making for longer life. Lubrication has been improved. This has been done by redirecting the oil through enlarged oil passages in the castings. Of course the fewer moving parts previously discussed has an important bearing on greater ruggedness.

In addition, various parts are based on proven existing designs. As one example, the ball head has been taken intact from the Type 3200 governor which itself is a refinement over the Type 3700 hydraulic governor.

Sensitivity—This ball head is said to be so sensitive that no improvement was necessary and therefore was used intact. The spring which restrains outward movement of the governor weights has a screw adjustment with which manufacturing inaccuracies can be compensated. With this adjustment the spring rate and load can be set. This permits selection of the rate of response best suited to the application.

Each governor is tested before it leaves the shop. This is done under actual load on a 4-cyl, Minneapolis-Moline engine driving a General Electric dynamometer. Observed tests showed that the steady-state stability was better than 0.1%. Isochronous or speed-droop characteristics are obtained by manual adjustment. Controls provide adjustment for speed changing, steady-state speed regulation, setting of the first compensation relay and second compensation timing valve, rate of response and load-limit throttling. All of these are discussed under—

Governor Operation

Oil Pump—Drive shaft 24 shown in Fig 4, is driven in either direction by the prime mover. The drive shaft rotates the gear pump 23. Oil from sump 58 is drawn into the pump gears past ball check 57 into the accumulator 54. A spring loaded piston 55 in the pressure chamber acts as a relief valve discharging oil at the relief port 56.

This pressure chamber holds a sufficient quantity of oil under pressure to meet momentary demands of the governor which may be in excess of the instantaneous rate of pump discharge. Oil from the pressure chamber is discharged through line 53 and leads to the pilot valve at the supply port of line 53 and port 39.

Flyball Head—Flyball head 21 is driven by the engine through a torsionally flexible drive 22. Radial movement of flyweights 20 causes the main pilot valve 19 to move up or down in response to speed changes.

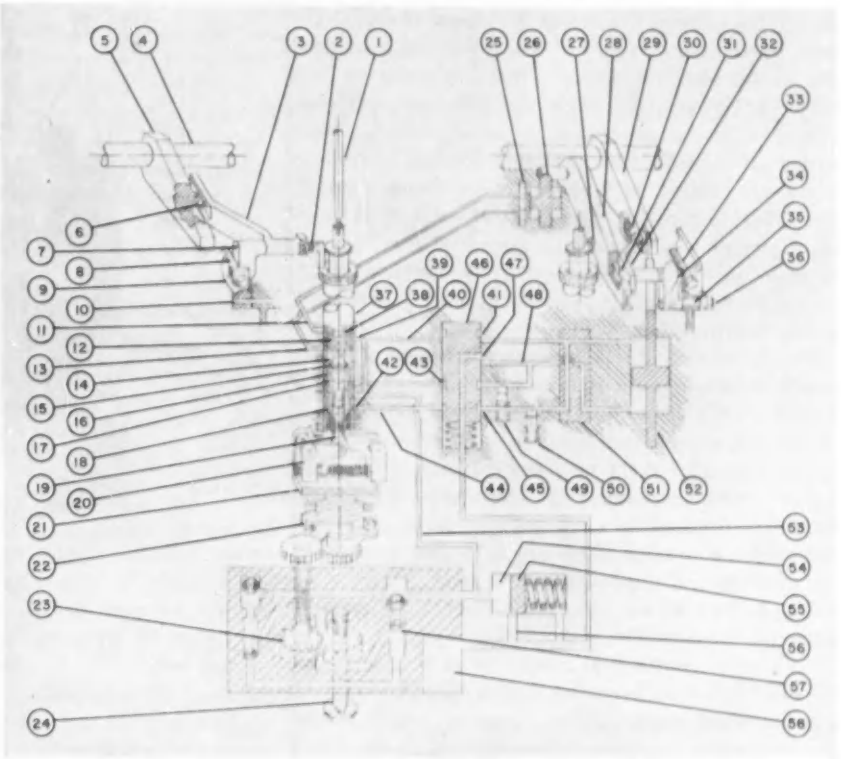
The mechanism as shown in Fig 4, is in the position it will assume when the engine is running at its normal speed. The action is as follows:

Governor Action—When speed increases, flyweights 20 move outward causing pilot valve 19 to move downward uncovering ports 17 and 18 in main valve 16. Pressure oil then flows through oil passage 44, through shut down valve 46, through reversing valve 51 and into the top side of power piston forcing the piston downward. Oil from the underside of the piston is redirected back through port 17 into chamber 14 and back to the sump through orifice 15.

Power piston 52 being connected to power piston lever 29 causes the throttle shaft to rotate in a direction to close the engine throttle. The degree of throttle shaft movement is limited by compensation as follows:

Relay or 1st Compensator—Power piston 52 moving downward actuates compensating lever 32, the latter being pivotally mounted on sector 34. Motion of lever 32 is thus transmitted to lever 28. Dashpot lever 28 is pivotally mounted on dashpot piston 26 and provided with trunnion pin 27. The latter is engaged with the upper end of a valve system. Thus downward movement

1—Speed changer stem
2—Sliding bearing
3—Lever
4—Shaft
5—Lever
6—Sliding bearing
7—Bearing
8—Adjusting screw
9—Sector
10—Fixed pin
11—Port
12—Dashpot valve
13—Port
14—Chamber
15—Orifice
16—Main valve
17—Port
18—Port
19—Pilot valve
20—Flyweights
21—Flyball head
22—Flexible drive
23—Gear pump
24—Drive shaft
25—Timing valve
26—Dashpot piston
27—Trunnion pin
28—Dashpot lever
29—Power piston lever
30—Sliding bearing
31—Sliding bearing
32—Compensating lever
33—Screw adjuster
34—Sector
35—Bearing
36—Friction lock
37—Main bushing
38—Threaded screw
39—Port
40—Oil passage
41—Valve port
42—Port
43—Port
44—Oil passage
45—Port
46—Shut down valve
47—Port
48—Oil passage
49—Flow control valve
50—Flow control valve
51—Reversing valve
52—Power piston
53—Line
54—Accumulator
55—Spring loaded piston
56—Relief port
57—Ball check valve
58—Sump



of piston 52 causes a downward movement of the valve system.

The lower portion of the valve system includes main valve 16 in which are located ports 17 and 18. The power piston 52 will therefore continue to move until ports 17 and 18, originally opened by a change of speed, are again closed. Closure of these ports will prevent further movement of the power piston and consequently will stop rotation of shaft 4. The degree of movement of shaft 4 is thus determined by the degree of original speed change and by the proportions of the relay.

This relay action in an isochronous governor is known as 1st compensation. Movement of shaft 4 in a direction to close the throttle causes a reduction in the speed of the engine to some value below the original increase. This reduction in speed causes the flyweights to reverse their original movement and pilot valve 19 is therefore forced upward. This return movement of the pilot valve would cause shaft 4 to reverse its movement and again open the throttle, but this action is prevented by means of the 2nd compensator as follows:

Dashpot or 2nd Compensator—The upper part of the valve system includes dashpot valve 12 which controls the flow of oil through ports 11 and 13 located in the main bushing 37. When the valve system is moved downward by trunnion pin 27 due to 1st compensation, valve 12 is displaced in a downward direction. It uncovers ports 11 and 13 permitting oil pressure entering at port 39 to flow to under side of the 2nd compensator piston 26, and allows oil on upper side to be discharged over the upper end of valve 12 to the oil reservoir.

Piston 26 is thus caused to move upward rotating lever 28 about its sliding bearing 31. The latter is mounted on lever 32. Trunnion pin 27 is thereby caused to move upward and this movement permits the valve system to rise. It should be noted that oil flowing to and from the 2nd compensator piston must pass through the restricted channels of timing valve 25.

The rate at which the compensator piston moves is thus controlled by the restrictions of the timing valve. Thus as pilot valve 19 is moving back toward its original speed position as already described, main valve 16 is also moving in the same direction and at approximately the same rate.

As the compensator piston will continue to move until valve ports 11 and 13 are again covered by dashpot valve 12, the final point of stability for the valve system is, therefore, identical with its original position. This is so because the position of the main bushing 37 which contains ports 11 and 13 is fixed when the governor is to be used for isochronous regulation.

Steady State Speed Regulation or "Speed Droop"—The term "speed droop" is used to denote the change in speed that occurs when the engine is running under no load condition as compared with the full load condition. The speed droop mechanism works as follows: Main bushing 37 is supported at sliding bearing 2 which is capable of sliding in a slot in speed droop lever 3. The latter is pivotally mounted on sector 9 at bearing 7. Sector 9 is rotatably mounted on fixed pin 10. Rotation of this lever is caused by the rotation of adjusting screw 8. The opposite end of lever 3 rides on a sliding bearing 6 attached to lever 5.

Thus as lever 5 is rotated due to movement of power piston 52, a movement is imparted to lever 3. Lever 3 is mechanically connected to main bushing 37 by an adjustable means in such a manner that movement of lever 3 may be employed for or prevented from shifting the vertical position of bushing 37. When sector 9 is rotated by means of adjusting screw 8, to a position such that center line of bearing point 7 is coincident with center line of bearing 2, the movement of lever 3 imparts no motion to bushing 37. This is the position for isochronous regulation or zero speed droop.

If, however, sector 9 is rotated so as to place bearing 7 out of line with bearing 2, then vertical movement is imparted to bushing 34 as the power piston moves. The mechanism is so constructed that when the power piston moves toward closed position due to load reduction on engine, bushing 37 is moved in a downward direction. The position of ports 11 and 13 are thus moved downward and the point of stabilization of the valve system is thereby set at a higher speed position. An indicator on the face plate shows the setting of this mechanism.

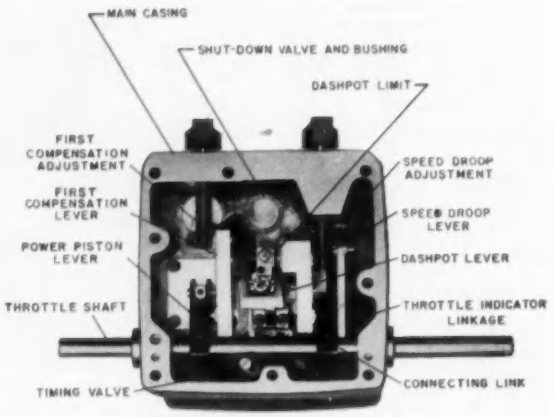
Speed Adjustment—Speed at which the governor will regulate the engine may be adjusted as follows:

Relative spacing between dashpot valve 12 and main valve 16 may be adjusted by means of threaded screw 38. By thus moving main valve 16 up or down relative to fixed ports 11 and 13, the neutral position of pilot valve 19 is likewise moved up or down. Consequently the flyball element must rotate slower or faster to bring valve 19 to the new neutral position.

Threaded screw 38 is rotated by speed changer stem 1 which is located in the top cover. A knob and indicating dial are provided to rotate speed changer stem 1 and to show the speed adjustment setting. A zero mark is provided to indicate normal position.

Adjustable 1st Compensation—Under the description of "relay" it was stated that the degree of movement of shaft 4 is determined by the degree of original speed change and by the proportions of the relay. To secure best operation from the standpoint of stability, it is desirable to be able to adjust the relay proportions to suit individual operating conditions or engine characteristics. This is accomplished as follows:

Lever 32 is pivotally mounted on sector 34 as already described. Sector 34 is again mounted at bearing 35 and may be rotated by means of screw adjuster 33. It will be seen that if the sector is rotated so that the point of pivot for lever 32 is moved toward the sliding bearing 30, the effective radius of lever 32 from point of pivot to sliding bearing 30 is shortened.



MAIN CASING ASSEMBLY WITH SPEED DROP AND AUTO SHUT DOWN

Thus lever 29 and consequently shaft 4 must move a lesser distance to produce the same amount of movement of trunnion pin 27, to effect closure of ports 17 and 18. By this means it is possible to secure the proper amount of power piston or throttle movement to produce the most stable action. When the final adjustment is obtained, friction lock 36 holds the sector rigidly in that position. A dial indicates the setting of the adjustment.

Flow Control Valves—Flow control valves 49 and 50 permit individual adjustment of the rate of corrective action to the "fuel on" or "fuel off" sides of the power piston. When valve 49 is rotated inward it restricts flow of pressure oil to the "fuel off" side of the power piston 52. When valve 50 is rotated inward it restricts flow of oil to the "fuel on" side of power piston 52.

Shutdown Valve—Shutdown valve 46 may be actuated by hand, solenoid or other suitable means.

When valve 46 is depressed a direct oil connection is made between the top of power piston 52 and the pump. Valve port 41 is aligned with oil passage 40 which is supplied with pressure oil by passage 53. When this connection is made, pressure oil is directed against the top of the power piston forcing it downward and closing the throttle.

Simultaneously port 47 is aligned with oil passage 48 bypassing flow control valve 49 and allowing unrestricted venting of the bottom of power piston 52 directly to the sump 58.

Ports 43 and 45 are closed as port 47 is opened. Port 43 is closed preventing any pressure oil from flowing through port 17 to the bottom of power piston 52

as the pilot valve rises due to a reduction in speed. Port 45 is closed to prevent pressure oil in passage 40 from being discharged to the sump past valve 50 and through oil passage 44 as pilot valve 19 rises and opens port 18. The shutdown valve makes use of differential areas to effect a hydraulic lock and will remain in the shutdown position until the governor oil pressure is almost zero.

Good Governor Practices

In order to keep this sensitive piece of mechanism in best operating condition for long periods, Farris engineers recommend that the following suggestions be practiced.

1. Precaution should be exercised to prevent dirt from entering governor. Foreign matter will hamper smooth governor action.

2. Only oil of turbine quality inhibited against oxidation, rust and foaming should be used. An oil with a viscosity of 400-450 S.S.U. is recommended.

3. Oil should be changed after 30 days initial operation and every six months thereafter. This insures the elimination of sludge and dirt that might have accidentally entered governor.

4. Solvents or kerosene should never be used for flushing. Solvents have a tendency to form sludge which interferes with governor operation. It is recommended that operating oil be used for flushing purposes.

5. A thorough understanding of the governor mechanism is required before making any adjustments.

6. To insure smooth governor operation the governor should be provided with as smooth a drive as possible.

Farris engineers say that many engine manufacturers are scheduled to test the new Type 3300 governor on their engines in the near future. For replacement of older type governors now in use in the field there will be no problem. Industry standard or custom mountings are included as an integral part of the unit.

The same governor exchange service plan now in use for older models will also be applied to the new governor. This plan was initiated because the management believes it is the fastest, least costly way to keep equipment working, minimizing down-time due to faulty or worn out governors.

The way the plan works is that Farris-Pickering sends you a guaranteed rebuilt unit with the same specifications as the one you have. After replacing your governor, you return it. Your cost is for the repairs to the original unit that you returned. This eliminates any delays.

The like-new governor will include all the latest improvements. Your old one goes into stock for later shipment to some other customer with a similar situation after it's repaired. According to factory standards, all rebuilt governors are tested on the dynamometer and you get a test report and curves on the governor shipped. Farris engineers say that this plan has been the best answer to many field problems.

Preventive Maintenance Pays For Itself

A *preventative* maintenance and service program has been instituted by the Towmotor Corporation. Aiming at 100% operating efficiency of its units in the field, it is tailored to avoid unnecessary repairs and to keep equipment on the job with a minimum of interruption.

Diesel engines supply a dependable source of power to these rugged little workhorses. Heavy-duty operation even of the diesel may lead to downtime unless servicing is done at regular intervals. This is where Towmotor's service department enters the picture.

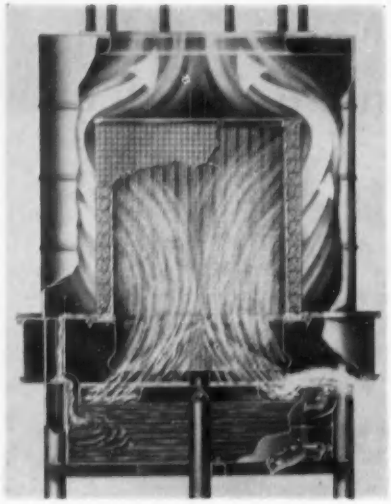
Towmotor feels that ruggedness and reliability have been built into these diesel trucks. Proper care through quality servicing at regular intervals will deliver it. Spotting trouble before it becomes serious should all but eliminate downtime.

The contract for the service agreement is the written understanding between the customer and the service department of Towmotor. Each item to be checked is indicated clearly. The periodic inspection covers only those repairs and services of a repetitive nature, although arrangements for major repairs have been written into the agreement.

The fifty-hour check list for diesel engine-driven vehicles consists of thirty-two separate items. These include complete inspection and service of the engine, engine components, and the special equipment. After the job is finished, a check list is attached to the vehicle. Any additional jobs that were done, as well as recommendations for further work are carefully listed.

Should an unforseen breakdown occur, Towmotor provides a fast, emergency service as near to the customer as his telephone. A completely-equipped "on-the-job" service truck is dispatched immediately. The truck is equipped to do the job right in the plant if at all possible. It carries a complete stock of replacement parts from which the factory-trained mechanic can draw.

Towmotor's preventative maintenance program spots trouble before it starts. This prevents unnecessary wear, which is still the best way to prevent unnecessary repairs. Breakdowns are prevented by periodic inspection and service.



Oil-Bath Filter Design Broadens Applications

Design details of a new oil-bath air cleaner feature high air-scrubbing efficiency with very low pressure-drop characteristics.

HIGH cleaning efficiency and low pressure-drop makes an economical oil-bath air filter available for a broader range of compressors, blowers and engines. With a major advance in filter design, Air-Maze Corporation's LPD achieves low pressure-drop operation without any moving parts or outside energy source; yet retains a very high level of filtration.

There is no question about the need for good air filtration. To emphasize this, a published report is again cited. It gives the results of an accelerated test with two identical engines, each running for a period of 150 hours.

During the test period, the air supply to one of the engines was properly filtered; to the other, a single handful of dirt was fed through the air intake, spread over the entire 150-hr of running. Upon completion of the test, the engine that used the contaminated air was using ten-times as much lube oil as the properly filtered engine. When the engines were disassembled, wear conditions on the dirt-treated engine were equal to 8000 to 10,000-hr of operation.

The ideal filter would strain 100% of the dirt from the air with no restriction to the flow. This is the goal at which filter designers aim. To achieve the most workable compromise, various designs and methods have been tested and used.

Oil scrubbing has long been an accepted and effective method of cleaning intake air. But in some cases—turbocharged stationary engines, for example—the energy required for oil-bath filtration has been too great. It was manifest in the form of static pressure loss. The only solution was to supply the required energy from outside, such as a moving curtain or motor-driven oil pumps.

In an effort to overcome the drawbacks and thereby broaden the applications of oil-bath filtration, Air-Maze engineers went to work. The result was the LPD filter, which reduces energy requirements, making it possible to eliminate power-consuming accessories. Moving parts are eliminated, and maintenance is reduced. This was accomplished by reversing the conventional oil and air circuit.

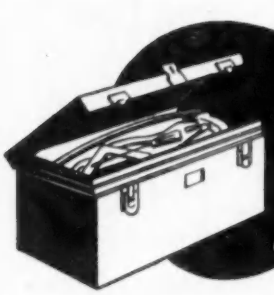
Air is drawn in under a weather hood set low on the unit. It is directed through an air-flow regulator tube to an oil-control pan. Here it picks up droplets of oil, which are carried up through a diffuser core. Both the oil and the air are thoroughly mixed, and the air is scrubbed in the process.

The oil-laden air then passes through the cylindrical filter element, where oil droplets and dirt particles are removed. Only clean, oil-free air is allowed to flow to the engine, blower or compressor. Oil and dirt collected flow down inside the filtration element through oil-return pipes. It goes to the sump where the dirt settles out. The clean oil is metered from the top of the reservoir into the oil-control pan through calibrated holes in the side of the pan.

Setting the air-flow regulator tube is done at the factory, varying with the rated capacity range of the filter. This method insures full oil-washing; yet keeps the pressure drop low.

Tests with a standard air-cleaner fine dust showed a high level of efficiency—97.5% of the dirt arrested. The low pressure-drop with this high level of filtration was equally good. The smallest of the four models (recommended for variable speed engines and compressors. Capacity range from 800-cfm to 3500-cfm) showed a pressure drop of 0.6-in water gauge at minimum to 4.8-in at maximum. The largest (for constant speed engines and compressors. Capacity range from 16,500-cfm to 24,000-cfm) showed a drop ranging from 1.9-in to 3.5-in.

The LPD oil-bath unit is designed for easy servicing. It features a quick-opening drain valve, and the weather hood and oil sump are arranged for easy disassembly. The unusually-large oil reservoir permits long operation before servicing is necessary.



Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Storing Gaskets

ANGELO CAPARDO, CHICAGO, ILL.—You may find, as I did, that when you take a gasket from supply it will be dry and out of shape. What we did wrong was to store ours in a heated room over the winter. The heat dried out the outside gasket in every bundle.

The moisture can be put back by putting the gaskets in a damp place for a while. We beat the problem completely by storing ours in a room where the temperature is always the same all year. It never gets dry enough to hurt the gaskets. We wrap gaskets that we don't use often in metal foil. This helps to keep them from drying out.

A bare-wood shelf will also act like a blotter. If you must place gaskets on a wooden shelf, put a coat of paint on the wood. It will help to seal it off.—Ed.

Removing Broken Studs

W. E. WARNER, WOODFORD GREEN, ESSEX, ENGLAND—Have you ever tried to remove a stud from a diesel engine and have it break off on you? Here is the way I've found best to take it out.

Get an old twist drill. If it is broken it doesn't matter; but it must be about 25% smaller than the stud. Resharpen it to cut *left-handed.*

After center punching the stud, start drilling it out. The best tool to use is a blacksmith-type brace that can be used with a drill shaped to bore to the left.

As the drill starts to bite into the metal, it grabs the stud as it shaves off the metal. This action loosens the threads. Because of drilling left-handed, the stud will loosen and be screwed out easily.

This is a switch on the E-Z-Out principle; but watch for drill breakage. To lessen this possibility it may be well to draw some of the drill's temper.—Ed.

Moving Heavy Diesels

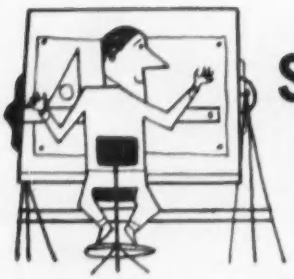
HARRY PENNINGTON, SAN ANTONIO, TEXAS—Your article "Tips on Installing a Diesel" (March, 1956) was excellent; however the average plant does not have overhead cranes to handle such heavy weights.

When a heavy engine is on rollers and skids, and a pull is taken to roll the engine, the rollers imbed a little in the wood of the skids. This causes the wire rope to stretch.

When sufficient pull is given to start the engine in motion, it is difficult to get it to move away smoothly and evenly. It tends to roll too fast, in a sort of initial leap. The wire rope acts exactly like a rubber band.

I developed a method for installing many heavy, pipeline pumping diesel engines. By using a chain tong on one end of the rollers, one man can move as much as 50-ton of engine short distances under control. This facilitates placing of the engine on its foundation.

Thanks for the tip. It sounds good to us.—Ed.



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

New Head Gasket For "9" Series International-Harvester Engines

A new cylinder head gasket (273 668 R1) made by Felt Product Company has been released for "9" diesel engines to provide an improved gasket giving a better compression seal, particularly at the holes under the precombustion chambers. This new gasket may be ordered through the regular service parts channels.

Adapting Dial Indicator to Check Alco Engine Cylinder Bores

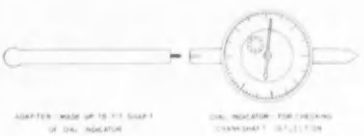
The dial indicator commonly used to measure crankshaft deflection may be used to check wear of 9-in and 12-½-in cylinder liner bores.

This method is faster and more accurate than checking for wear by the use of an inside micrometer. The procedure for setting up gauge follows:

1. Make an adapter, the diameter of which will allow it to fit correctly into the dial (see accompanying Figure). The length of the adapter will be the bore of the cylinder minus 1½-in to allow for the dial indicator.

2. The free end of the adapter (that part of it which will rest against the wall of the liner) must be rounded off.

3. Insert the other end of the adapter into the indicator.



To set the dial indicator to the original bore of the liner, measure the bore of the liner above the ring travel of the piston.

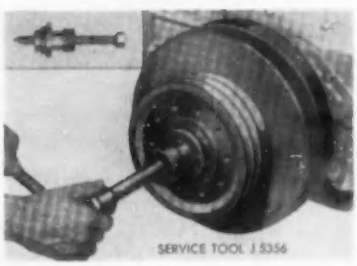
GM Crankshaft Hub & Pulley Remover

Certain Series 71 and 110 engines are equipped with "rubber mounted" crankshaft pulleys while other models have used fans mounted directly on the crankshaft and driven through "rubber mounted" hubs. Some of the pulleys and hubs have tapped puller holes while others incorporate an internal thread to facilitate removal from the crankshaft. Due to the flexibility in the pulley or hub (from the rubber mounting), it is not only very difficult, but also conducive to damage, to attempt to remove a rubber mounted pulley or hub by striking the rim with a hammer, or by a jawtype puller.

Tool J 5356 has been designed to remove the "rubber mounted" pulleys and fan hubs efficiently.

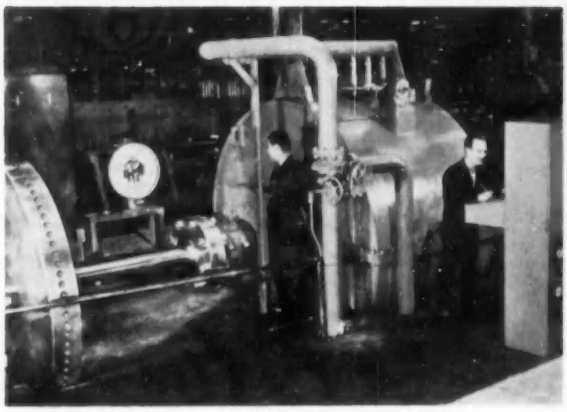
To use the tool on fan hubs, screw the 2⅛-in x 16 thread into the hub as far as possible with the center screw backed off; then force hub off crankshaft by turning down on center screw. Use on rubber mounted pulleys that have an internal thread in the same manner, except that the 2½-in x 16 thread should be employed.

The tool can also be used on pulley hubs that have tapped puller holes providing the bolt circle is not larger than 2-19/32-in in diameter and the puller bolts used are 5/16-in or smaller.



Orders for this tool should be directed to the supplier—Kent-Moore Organization, Inc., General Motors Building, Detroit, Michigan.

news of our industry



Enterprise Builds Huge Dynamometer

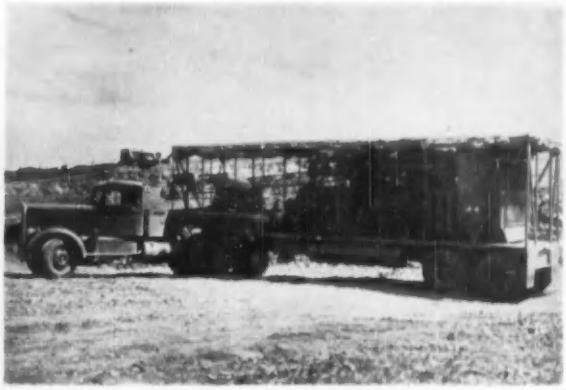
Claimed to be the largest hydraulic dynamometer in the West, this 10,000-hp, 400-rpm capacity unit has been constructed by Enterprise Engine & Machinery Co. to test its new 12- and 16-cyl RV Series diesel engines.

Outside dimensions of the new brake are 13-ft, 2-in long by more than 10-ft wide. It weighs 90,000 lb, taking in shaft, rotor, and the two major assemblies that form the casing and stator. A significant dimension is the shaft diameter—13¼ in at the coupling. Cost of building was over $250,000.

Most novel arrangement is the method for metering water through the mechanism, for adjusting the braking effect. Adjustable weir gates take the place of the usual setup of inlet and outlet water valves and pressure regulators to vary the hydraulic load. This avoids the effects of water supply pressure fluctuation.

The dynamometer itself is only a part of an extensive installation in a pit 76-ft long and 22 1/3-ft wide. The dynamometer is at the center so that an engine can be assembled on the foundations at one end while a second engine is tested at the other end. An intricate piping and pumping system in the pit conveys fuels, cooling water, lube oil, and other utilities to their connecting points.

Cooling facilities are located on the roof of an adjacent plant bay and include a Marley cooling tower for lube oil cooling water flowing at 600 gpm, Young radiator and fan for test engine jacket water at 1000 gpm, and Young radiator and fan for dynamometer water at 800 gpm.



Mobile Power Package

Supplying the field power to run portable rock crushing machines around the Portland, Oregon area is this packaged and mobile generator set. A 385-kw, 480-v, 3-phase, 60-cycle unit, the generator is driven by a turbocharged Cooper-Bessemer Type FW-6T diesel rated 550 hp at 900 rpm.

The combination of turbocharging and a relatively slow speed engine has certain advantages to Rogers Construction Co. which is making use of the power plant in its road building and fill operations. Turbocharging develops higher cylinder pressures to net more horsepower per cubic inch of engine displacement. And slower engine speeds result in less maintenance.

Compactness has been achieved by mounting engine, generator, and radiator units on one skid. A rubber-tired trailer makes the package mobile and capable of being hauled to any location where electric power is needed. The construction firm has the unit running throughout the day at full 550-hp load.

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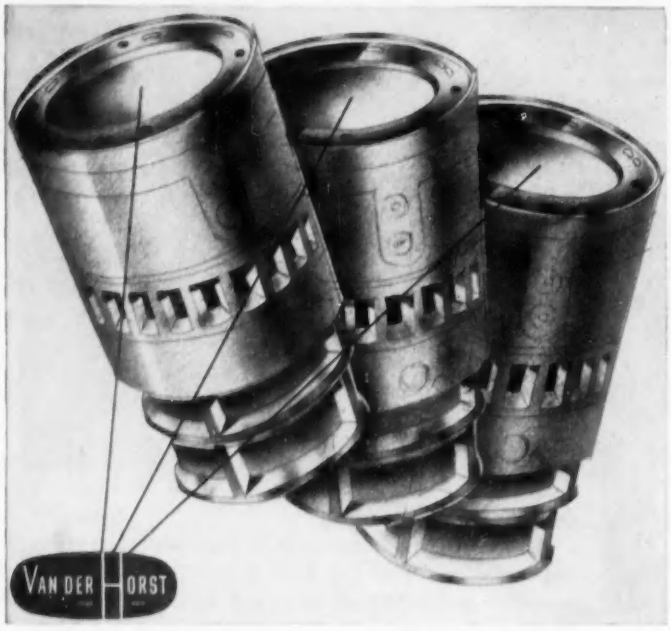
new literature . . . . Page 76

5 *big advantages of*



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news of our industry

Develop Lubes for Atomic Use

Synthetic lubricants which perform better when subjected to atomic radiation than under ordinary operating conditions are now being produced, Standard Oil Co. of Calif. researchers have revealed. The announcement, the first public disclosure of secret work on lubricants which can function in atomic engines, was made by means of a technical paper presented before the American Soc. of Lubrication Engineers.

California Research Corp., Standard's research subsidiary, has been working on the problem of radiation-resistant lubricants for a number of years, paralleling development of nuclear propulsion units for aircraft and sea vehicles. Conventional lubricants tended to deteriorate when exposed to radiation.

The project, part of which was conducted with test machinery inside the nuclear pile at Oak Ridge, established that the wear properties of a "poly-(propene oxide)"-type lubricant actually improve upon irradiation. By contrast, wear properties of two other synthetic lubricants tested were found to be worse in the presence of radiation than outside the atomic pile. The technical paper reporting these results is entitled "Lubrication in the Presence of Nuclear Radiation", by Dr. R. O. Bolt and J. G. Carroll.

Pipeline Extension Planned

Transcontinental Gas Pipe Line Corp. has filed application with the FPC for a $42,308,000 pipeline construction project entailing over 277 mi of pipeline to be laid in La., Miss., Ala., Ga., S. Car., N. Car., Va., Md., and Pa. A total of 12,750 hp units at various compressor stations, additional facilities at existing stations, river crossings, and various distribution meter stations will be included in the construction.

The additional facilities will enable the company to increase its capacity by approximately 104,500,000 cu ft daily. Construction is scheduled to start in July.

news of our industry

Railroad Studies Diesel Fuel

In an endeavor to find out what fuel oils blend best in locomotives to give maximum efficiency, a large southeastern railway has recently begun tests under operating conditions. They are aimed at prolonging the life of lubricating oils as well.

The tests make use of a standard 1000-hp passenger-type diesel-electric engine and generator. The unit has been bolted down and bound around with instrumentation wires and tubes to permit electronic and mechanical study under a variety of performance conditions. The instrumentation is said to provide a detailed and constant electronic picture on a cathode ray oscilloscope screen which operates in the same way as a television receiver. The screen is also continuously photographed by a stripfilm camera, for a permanent record.

The picture shows pressure at every point in the engine cycle and the position of the crankshaft and piston at the instant of fuel injection. From this, information is gathered such as ignition lag, point of peak pressure, maximum pressure, injection timing, rate of fuel burning.

Other instruments, at the same time, are recording the water temperature at 31 points on the engine, lubricating oil, and the exhaust gas stream. Also recorded are the engine's speed, its vibration, and power generated. At the end of the run, the fuel consumption is determined by weighing what remains in the supply tank. Another phase of the test is the use of lube oil additives.

Trucker Orders 50 Diesels

One of the top 10 motor freight carriers in the country, McLean Trucking Co., is augmenting its road fleet by 50 heavy-duty diesel GMC tractors. These are Model DF662-47s.

The present all-GMC fleet is said to average over 100,000 mi per truck annually, with some having amassed a total of 700,000 mi. The road equipment availability factor averages 94%, which is considered exceptional.

Here a mechanic uses a Heavy Duty Loxocket Wrench with ratchet adaptor to tighten down a bearing cap on a diesel engine. In this shop, all caps are first assembled without drive shaft and bearings so that bore alignment can be tested with a special cylindrical checking bar.

*Snap-on Tools

grip safe — grip sure

A man can lean into this Extra Heavy Duty Loxocket* Wrench — and do it with confidence. It has the strength and heft to handle the big, nut-turning jobs — quickly, surely, easily.

Sockets are hot-broached providing smooth walls and corners that are free from tears and cracks. They're heat-treated all the way through for toughness on the inside as well as the outside. These, and many other developments, give *Snap-on* tools that extra measure of strength, long life and smooth fit. They'll cut your tool costs — and your downtime.

If you have a problem involving special tool design or application or any other question on tools, talk it over with your *Snap-on* man. Write us or call your nearest *Snap-on* branch. Free catalog of mechanic's hand tools is yours for the asking.

*Snap-on is the trademark of Snap-on Tools Corporation.

SNAP-ON TOOLS CORPORATION

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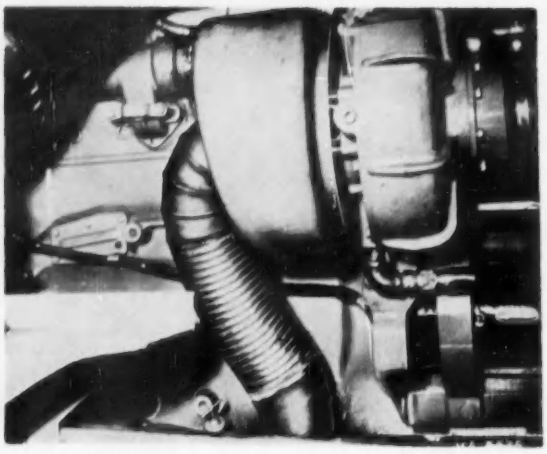
Kenosha, Wisconsin

new products



High-Temperature Exhaust Tubing

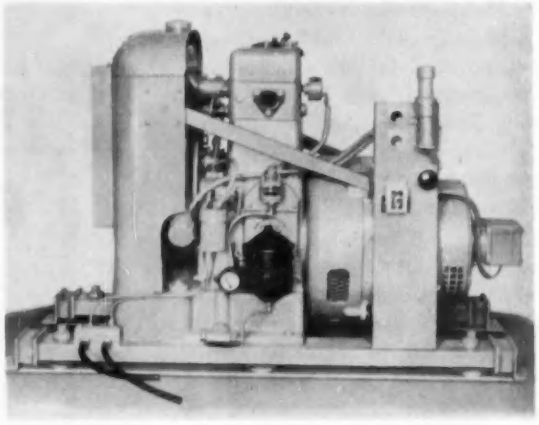
Ability to withstand constant exhaust temperatures of up to 1250°F without damage is the major feature of new stainless steel tubing soon to be marketed by Universal Metal Hose Co. Other features are permanent flexibility, corrosion-resistance, and vibration-absorbency, to provide long service life and reduced maintenance. The tubing will come in two types.

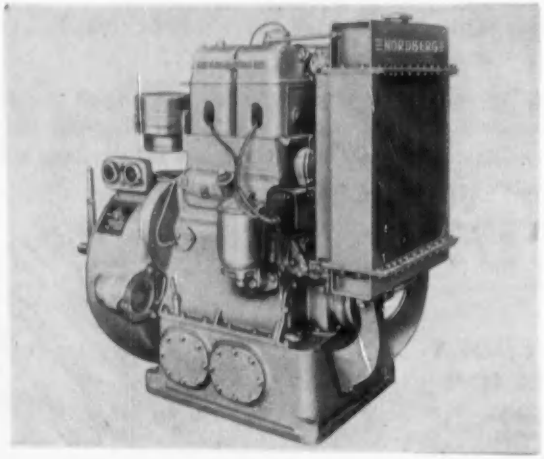
Type U-140-S incorporates a soft copper wire packing which functions to plate the interlocking tubing joints while in use, a property which is claimed to give maximum flexibility under extreme vibration and high operating temperatures. Type U-120-S is of similar construction but without the copper wire packing, to make it lower in cost while still highly efficient. Both types are fabricated from chromium-nickel 302 alloy steel.

Caboose Lighting Set

Ample power for lights, radio, refrigerator, cooking range, and heating for cabooses is the function of this diesel-generator set incorporating the Fairbanks-Morse single-cylinder Model 45. It is offered in two sizes with capacities of 3 kw and 6 kw at 80% power factor.

The engine is a constant-speed, 1800-rpm, 4-cycle unit of valve-in-head construction and featuring full-pressure lubrication throughout. It is arranged for hand starting, with option of a 12-v electric system. The set's AC generator is direct-connected and permanently aligned. An electronic voltage regulator, with no moving parts, holds variations within 5%. And to isolate engine vibration and cushion car shocks, a special shock absorbing mounting is provided.





Oil Field Pumping Unit

Addition of this 2-cyl gas engine to its Power Chief series of small prime movers has been announced by Nordberg Mfg. Co. Called the Model FG2, it extends the horsepower range of the series to oil field pumping service. The new model has an API rating of 12-24 hp at 800-1800 rpm.

A 4-cycle unit, it has a 4½-in bore and 5¼-in stroke with a piston displacement of 167 cu in. Compression ratio is 6:1. It is equipped with a combination gas-gasoline carburetor and a gas pressure regulator. Safety shutdown controls for low oil pressure and high water temperature are also standard. Additional safety features are enclosed clutch, flywheel, and fan. The radiator is said to be large enough to assure trouble-free operation up to 125°F ambient temperature.

Hydraulic Torque Converters

Until recently, National Supply Co. has limited its single-stage torque converters to use on oil field machinery and equipment. The company now announces that it is making its full line of heavy-duty units available for general industrial applications. A new sales entity has been set up within the organization to handle their marketing on a world-wide basis, and new manufacturing facilities have been established at the National Supply plant in Toledo, Ohio.

No limits have been applied to the converters. However, principal uses other than on oil well drilling rigs are envisioned for construction, excavating, earth-handling, and mining equipment, with other applications to follow.

The units are currently being manufactured in a range of from 100 to 1000 hp. This has been achieved with six basic sizes which include 17 power capacities in closely spaced ranges for exact matching with engines and electric motors. The power ranges are provided by modification of the converter hydraulic circuit.

The three hydraulic elements of the converters—pump, turbine, and stator—are aluminum alloy castings. A new factory method has been developed to accomplish the required precision in fluid passageways and blading contours. This is said to give the converters unusually high efficiency in power transmission.

The converters can be mounted in any position. The pictured item has a cooling radiator for hydraulic fluid on it. It covers a power capacity range of 160 to 330 input hp at 900 rpm. Overall height of this particular unit measures 6 ft from the bottom of the mounting pad under the output shaft to the top of the radiator.

Municipal Power Plant
Relies on **Young** *Coolers*

Young Horizontal Core Radiators cool jacket water serving the 3 power plant engines.

Fairbanks-Morse 960-HF O-P Dual-Fuel engines supply power and light to Brackenridge, Pa.

Young "HC"® Units
Cool Dual-Fuel Engines

Another example of Young-preference when it comes to *dependable performance required!* When Brackenridge, Pa., built its own power plant rather than buy from expensive and impractical outside sources, this community wisely specified dual-fuel engines cooled by Young radiators. Effective and efficient use of fuels, gas and oil, enables the power plant to operate with sizeable savings to Brackenridge.

Young HC Horizontal Core units are available for water, oil, gas cooling and steam and vapor condensing in any combination. HC features include, (1) low speed fan gives high efficiency performance at minimum horsepower requirements and low operating cost, (2) vertical air discharge provides even air distribution—eliminates air recirculation and effects of cross winds, (3) compact Young design permits space-saving, in-line installations of 2 or more units for additional capacities and services. Young HC units combine *efficiency, economy, versatility.*

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Solving heat transfer problems is what we do best because it is our very reason for being. You, too, can harness the power of Young engineering talent. Write, wire or call without obligation.

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organizational news

W. F. Flowers

R. J. McDonald

Changes at Federal-Mogul
have placed William F. Flowers in the spot of export manager to succeed Fred E. Halloran who has retired. Mr. Flowers' former position of New York district manager is now in the hands of R. J. McDonald who has transferred from Minneapolis.

Fuel Injection Servicing
is the function of a newly formed corporation, Fuel Injection and Electric, Inc., which has begun operations in Milwaukee. It has been appointed a factory distributor for American Bosch equipment. Officers are Benjamin Weber, president; Robert S. Weber, vice president; and Robert J. Baer, secretary-treasurer.

Chairman of the Board
of directors and chief executive officer is the new capacity of John L. McCaffrey after elections at International Harvester Co. He is succeeded in his former position as president of the company by Peter V. Moulder, who advances from executive vice president.

Two Promotions
at Cooper-Bessemer Corp. have taken place in the locomotive engine program. Melvin J. Helmich is now supervisor, railway engineering; and Edwin J. Fithian, Jr. has become project engineer, locomotive engine development.

M. J. Helmich

E. J. Fithian, Jr.

Here's Why

PERFORMANCE IS BETTER WITH Bendix STARTER DRIVES

CHECK and COMPARE THESE FEATURES
• Starting motor can be mounted more easily and in more positions.
• Requires no actuating linkage—solenoid can be placed in any convenient position.
• Simple in design—has fewer parts—needs fewer adjustments.

It takes a truly outstanding product to receive over 100,000,000 endorsements. Yet, that's the number of Bendix Drives that have been installed. No other starter drive approaches this record of outstanding performance. That is why, whatever your type of diesel or whatever its purpose, it will pay you to specify Bendix* Starter Drive for the most economical installation and dependable performance. *REG. U.S. PAT. OFF.

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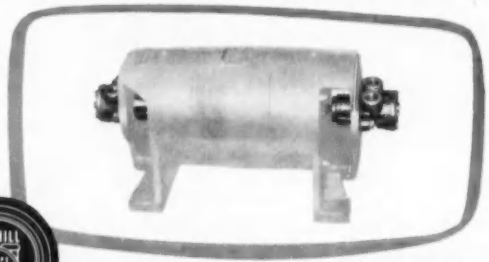
...for FUEL TRANSFER and
HYDRAULIC GOVERNOR SERVICE

TUTHILL
Model L

It holds its prime. It's mechanically sealed and leak-free. It's quiet in operation. It's low in power consumption. And it's built to give years of uninterrupted service. That's why the Tuthill Model L positive displacement, internal-gear rotary pump is preferred for fuel transfer and hydraulic governor service. Capacities from .33 to 6 g.p.m. in wide pressure ranges.

Write for Catalog No. 101 for complete details.



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and firing
pressures
faster

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COMPACT

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K-100

The Model K-100 Kiene Pressure Indicator accurately measures compression and firing pressures — assures the proper maintenance of diesel engines — helps prevent costly down time. Only one moving part — no friction or inertia effects — no complicated adjustments.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

organizational news

General Manager
of the test equipment division of Consolidated Diesel Electric Corp. is now the post of Louis B. Haberman. He was formerly sales manager of the division, which has just moved into its separate quarters.

Tube Turns Has a New President
in the person of John G. Seiler, who has also been elevated to a vice presidency at National Cylinder Gas Co., the parent organization. He's been with Tube Turns since 1930.

Stocking Distributor
for Atlantic Metal Hose Co. is the newest appointment of the Moore-Handley Hardware Co. for Ala. and areas in Tenn. and Ga. The firm will carry a complete line of flexible metal hose and will feature overnight delivery service.

Latest Addition
at Sharples Corp. is Gilbert F. Richards, joining as vice president in charge of sales. He has been with the Henry J. Kaiser organization for the past 15 years.

G. F. Richards

W. L. Larson

Switching Over
from the general managership of Alco Products Corp., thermal products division, Wilford L. Larson has become assistant to the vice president of operations at American Bosch Arma Corp.

Top Management Promotions
have occurred at Fram Corp. Steven B. Wilson, chairman of the Fram board, is now also honorary chairman of Warner Lewis Co., Fram subsidiary. J. Norman Fitzgerald has been elected president of Warner Lewis Co. to succeed Warner Lewis who has taken over as chairman.

Named Deutz Distributor
in southern California is Air-Cooled Diesel Engines Sales and Service. The company will maintain stocks of engines and spare parts as well as facilities for installation and servicing.

Four Changes at Worthington
have taken place in the Harrison Div. E. C. Schmachtenberg has been named assistant to the manager of engineering; Hunt Davis is the new chief engineer, compressors; C. A. Macaluso is assistant chief engineer, compressors; and, W. F. Donovan is now assistant manager, research and development.

new literature

Bearings, Bushings, and Bars
are given full coverage in a 110-page miniature catalog available from Johnson Bronze Co. The company's entire line is detailed.

Lubrication Newsletter
is the name of a new house organ being published by The Alpha Molykote Corp. First issue carries a lead story on press fitting with MO_2 lubrication. The firm will be glad to place you on its mailing list.

Tubes and Plates
for condensers and heat exchangers are discussed in applicational detail in a 44-page manual of American Brass Co. The information presented is slanted toward engineers responsible for selection of suitable alloys.

To Aid Compressed Air Users
understand the moisture problem in compressed air systems, Hankison Corp. is offering "The Dew Point Story". It is a 6-page booklet presenting a non-technical explanation of the difference between such terms as "dew point" and "relative humidity".

Replacement Engine Parts
and overhaul kits for GM diesels are listed in Catalog No. 45, now available from Surplus Automotive Co. Every replaceable part from gaskets to fuel injectors is included.

Hose Couplings
that are tilt- and blowout-proof are described and illustrated in a 28-page catalog published by Anchor Coupling Co.

The Problem of Noise
a multi-million-dollar one for industry, is presented in a question-and answer-form booklet prepared by Mine Safety Appliance Co. Background information is supplied along with methods of combating noise fatigue and damage.

Proper Use of Portable Lifts
detailing the where's, when's, and how's, is the subject of free literature from Oster Mfg. Co.

Air-Cooled Heat Exchanger
developments are described in a 24-page bulletin offered by Griscom-Russell Co.

Planetary Gear Transmissions
are the concern of an 8-page booklet from American Gear & Mfg. Co. Seven different models are discussed, offering one or two forward speeds, choice of reverse gear ratios, and 85- to 200-lb-ft torque.

Synchro-Start
SPEED SENSITIVE SWITCHES

SYNCHRO-START MODEL GA-3 will open or close three independent sets of contacts at three different speeds and are suitable for installation on AND20005 aircraft tachometer drive pad. The units are adjustable while running. Standard governors can be furnished to trip points between 1,200 and 6,000 R.P.M. Speeds above or below these points must be referred to our Engineering Department for special considerations.

These speed sensitive switches are available for various types of drives.

One, two, and three switch units employ the same basic governor flyweight principle which has been used successfully in SYNCHRO-START OVERSPEED GOVERNORS during the past fifteen years.

Request Bulletin 504

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVE. • SKOKIE, ILLINOIS

AMOT SAFETY CONTROL

AMOT Model 1476-47 automatically shuts down engine on high water temperature or low lube oil pressure. Features are:

1. **No capillary tube and bulb used.**
2. **Uses well known AMOT element.**
3. **Several temperature sensing units can be used with one control unit.**
4. **Will operate an air whistle.**
5. **Will operate a diaphragm gas valve for large gas engine shut down.**
6. **Will operate as a diesel fuel shut off valve.**
7. **Available with 2" direct connected gas valve.**

AMOT CONTROLS CORPORATION
RICHMOND 1, CALIFORNIA

what is your noise problem?

Chances are there is a standard Kittell silencer that will solve it.

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915 South Santa Fe Avenue, Los Angeles, California

REBORE CONNECTING RODS IN YOUR OWN SHOP

New GREENLEE HYDRO-BORER

Assures precise alignment.
Accurate to .0003" T.I.R.
Fast precision boring.

Quick, easy setups.
For any size rods.
A money-maker in every engine shop.

WRITE FOR COMPLETE INFORMATION

GREENLEE BROS. & CO.
2166 MASON AVENUE
Rockford, Illinois

new literature

Switchmobile

the LeTourneau-Westinghouse Co. rubber-tired diesel railroad switcher, is given full treatment in a 24-page bulletin. An adaptation of the Tournatractor, it is claimed to outperform conventional types.

V-Belts

are the subject of a new bulletin issued by Worthington Corp. Featured are steel cable belts which are said to be especially adaptable for drives requiring extra strength and heavy continuous service.

Traxcavator No. 977

Caterpillar Tractor Co.'s largest front-end loader, is the subject of the latest broadside from that company. With a bucket capacity of 2¼ yd and a horsepower rating of 100, the machine incorporates advanced features such as oil clutch and automatic kick-out mechanisms, all detailed.

Heavy-Duty Mufflers

for trucks and buses are the subject of a 12-page catalog of Alexander-Tagg Industries, Inc. Specification and application charts are included, listing recommendations for different makes of vehicles and engines.

Standard and Special Gauges

built by Dearborn Gage Co. are illustrated in a 48-page catalog containing complete specifications and prices on the entire line.

Corrosion of Metals

at elevated temperatures and pressures in aqueous heat exchange systems can be measured by a hydrogen effusion method. It's the subject of a recent report of Navy research just released to industry by the OTS.

Neoprene at Work

in the automotive industry is the subject matter of the latest literature from E. I. du Pont de Nemours & Co.

FPC Regulations

under the Natural Gas Act have been put into a pamphlet which sells for 35¢. It contains the Commission's rules and regulations in effect as of April 1, 1956.

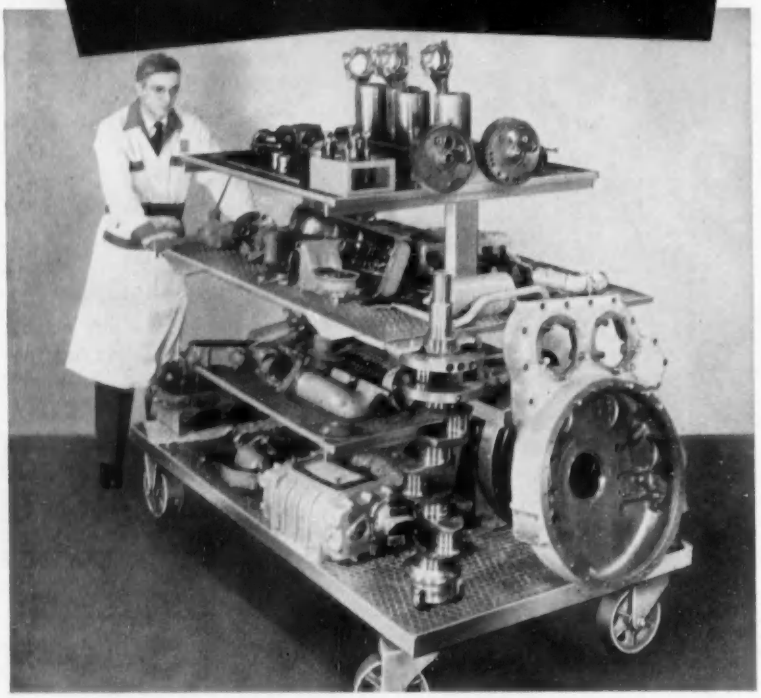
Colloidal Dispersions

and semi-colloidal dispersions for maintenance, lubrication, and other applications, are listed in 4-page booklet of Acheson Colloids Co. Carriers and diluents are given for each along with typical applications and physical data.

Maintenance Work Problems

encountered when using carbide-tipped masonry drills can be avoided by following recommendations worked out by its design and application engineers, the Carboloy Dept. of General Electric Co. declares. These have been incorporated in a table which includes speeds, drill sizes, and pressure requirements for various materials.

New! COMPACT, PORTABLE KENT-MOORE PARTS RACK SPEEDS DIESEL ENGINE OVERHAUL . . .



Worried about the time and cost factors of repairing your diesel engines? Here's a *real* helper! Kent-Moore—world's largest manufacturer of special engine repair equipment and tools—now offers a versatile new Parts Rack (J-6387) specially designed for Detroit Diesel Engines, Series 51, 71, 110. But it can be easily adapted for *any* diesel engine!

THESE UNIQUE FEATURES

- Over 60 square feet of shelf space—no need to stack precision parts.
- Damage points protected with rubber or plastic.
- Six-inch wheels assure maneuverability: two rigid, two swivel.
- Crankshaft held safely and securely.
- Adjustable holder for crankshaft.
- Convenient bracket holds flywheel securely.
- Space for engine block and head.
- Easily and simply assembled.

OFFER THESE MANY ADVANTAGES

- Convenient temporary rack for engine parts.
- Holds *all* parts of a complete engine assembly.
- Move all parts of a disassembled engine at once.
- Make cleaning of engine parts easy.
- Conveniently positions parts for inspection and assembly.
- Avoids cluttered shop—improves appearance.
- Cleaner parts at time of assembly

Engine manufacturers agree: it's wise to have one Kent-Moore Parts Rack for each engine being overhauled.

Why not investigate the most convenient and versatile Parts Rack ever devised. Write today for price and delivery information.

KM **KENT-MOORE ORGANIZATION, INC.**

Dept. C, 1501 So. Jackson St., Jackson, Michigan

ENGINEERS AND MANUFACTURERS OF SPECIAL SERVICE TOOLS AND EQUIPMENT

news of our industry

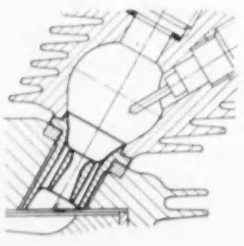
Precombustion Chamber Design

The German engine firm of Motoren-Werke Mannheim AG, announces that it has developed a new system for high-speed diesel engines. It is based on the classic precombustion chamber system, differing from it by having substantially no difference of pressure between the precombustion chamber and the main combustion chamber during the working stroke.

This feature is said to sharply reduce fuel consumption. An optimal value of .39 lb/hp-hr has been obtained for a single cylinder engine of 12 hp output. Equality of consumption from high to low speeds and good part load behavior are other features. These properties are also said to result in a sharp drop of average fuel consumption in vehicle performance.

Called the balanced pressure precombustion system, it is also claimed to reduce the tendency toward smoking. Peak firing pressure is 925 psi. Noise level has been reduced by diminishment of the speed of pressure rise to approximately 28 psi per degree of crank angle. The combustion noise is said to lie under the noise level of gears, valves, or pistons. Diesel knock when idling is eliminated as well.

The system is claimed capable of utilizing all fuels produced in a distillation up to 950°F under nearly constant consumption and noise conditions without need of additives. And no modifications of the engine are required when changing from one kind of fuel to another. No special injection equipment is said to be necessary. Starting properties are said to be nearly the same as in a diesel engine with direct fuel injection. Cold starting is possible without aid down to 14°F, with a conventional glow plug for lower temperatures.



news of our industry

Wins Canadian Power Contract

The British Columbia Power Commission has announced the awarding of a $2.6 million contract to the Cooper-Bessemer Corp. for seven 3000-kw dual-fuel units. Four of the diesels are for a new generating station to serve Prince George and the other three are for a new plant at Quesnel. The dual-fuels were ordered in anticipation of natural gas becoming available to the two interior centers.

The Prince George plant will replace an existing city-owned station. It will supply about three times the current power capacity of the area, with an allowance for expansion to about 60,000 kw. The site for the Quesnel plant has not as yet been decided. But it will replace an existing 4200-kw diesel plant.

Cooler Firm Joins Shipbuilder

Engineering Controls, Inc., manufacturer of the patented vapor phase system of engine cooling, announces that it has become an affiliate of the St. Louis Shipbuilding & Steel Co. Its main offices will now be located in St. Louis, Mo.

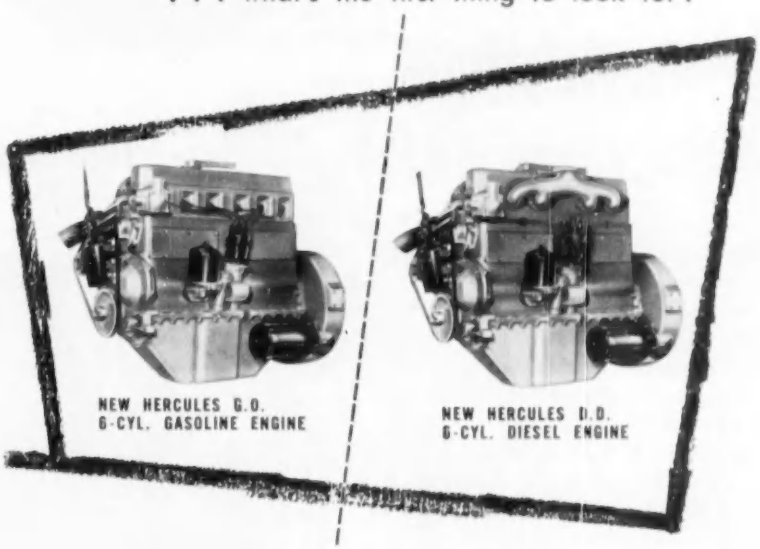
Alco Opens New Warehouse

Los Angeles is the site of a new warehouse and office building just opened by Alco Products, Inc. This facility will serve as a West Coast locomotive parts depot so as to reduce the investment of railroads in parts inventories in that area. It is set up to accommodate 15 railroads operating approximately 1000 Alco diesel locomotives.

The warehouse incorporates 21,000 sq ft of floor space within its 100- by 250-ft structure on a 1½-acre property. Completed in November, the building has been designed for palletization and other modern materials handling methods. An adjustable dock ramp is located at the rear of the building, served by a Santa Fe railroad spur. More than 7000 normal locomotive wearing parts are to be stocked.

WHEN YOU BUY AN ENGINE

. . . what's the first thing to look for?



Of course, some people look at the "outside" of an engine and see only a nice shiny paint-job. But that's not too important. Other buyers look at what's "inside" an engine. That can be very important. However, we think a buyer should also look at what's "back of" an engine. That's why we at Hercules Motors Corporation guard the enviable reputation we have earned in more than 41 years of engine building experience.

Hercules' reputation isn't merely a way of doing business or just the top quality of our product. We feel that our reputation means more than good business ethics and a quality product. Our reputation also means supplying new and better engines to meet the various needs of our customers.

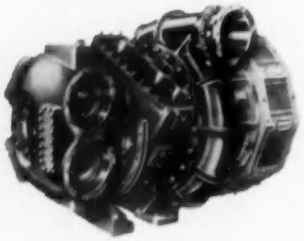
As an example, our new line of INTERCHANGEABLE engines gives the customer the choice of gasoline or diesel power without changing engine mountings in the end product. These new G.O. (Gasoline Overhead valve) and D.D. (Direct injection Diesel) engines, not only have the same mounting dimensions in engines of the same number of cylinders, but many component parts are also interchangeable over the entire range of these new models.

Years of engine building "know how" stand "back of" every Hercules Engine. In addition, our wide selection of more than 90 models of engines and power units, available for operation on gasoline, diesel fuel, natural gas, L.P.G. and kerosene, provides a dependable source of power for all requirements between 3 and 500 H.P.

For help in solving your power problems, contact our factory. Our sales-engineers will be glad to assist you. No obligation, of course.

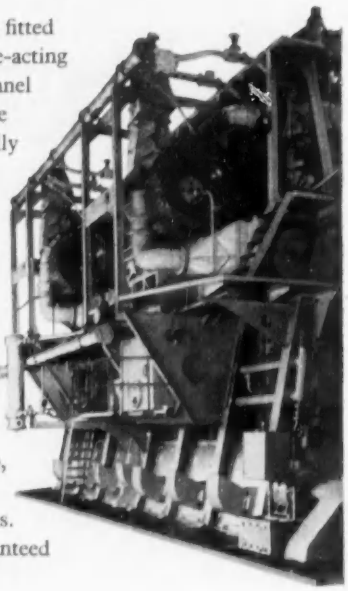
HERCULES MOTORS CORPORATION

CANTON 2, OHIO



Harland & Wolff

chose these Napier Turbo-Blowers



Two Napier Type MS 600 turbo-blowers are fitted to the Harland & Wolff S.A. 6. 8,000 h.p. single-acting two-stroke Diesel which powers the Blue Funnel Line M/S DEMODOCUS. The S.A. 6 is one of the first engines of its type to be successfully turbo pressure-charged without the use of mechanically driven scavenge pumps. Why did Harland & Wolff choose *Napier* turbo-blowers? Here are three good reasons—

- Napier blowers have *high adiabatic efficiency*, resulting in maximum power increase and low fuel consumption.
- Journal bearings on the MS 500 and 600 Napier blowers are sleeve type, and with proper lubrication they will last as long as the engine itself. The MS 500 and 600, the largest blowers in the Napier range, are built especially for marine applications.
- A high standard of workmanship is guaranteed by Napier's long experience in precision engineering.

Napier turbo-blowers are available in seven sizes for engines of 140-4,000 h.p. afloat and ashore. Multiple installations for engines of higher powers. On 4-stroke Diesels they can double the power, on 2-strokes they increase it by over 30%—often at a lower specific fuel consumption. Napier turbo-blowers are currently in use in 69 countries.

for this engine

which powers this ship

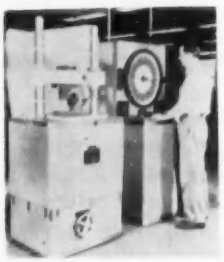
NAPIER Turbo-blowers

D. NAPIER AND SON LIMITED · LONDON · W.3 · ENGLAND

REPRESENTATIVE: L. O. BROOKS, SUITE 509, DUPONT CIRCLE BUILDINGS, 1346 CONNECTICUT AVENUE N.W., WASHINGTON 6 D.C. TEL: DUPONT 7-2123

CBCT9

news of our industry



Automatic Load Tester

Tension and compression loads are now being automatically cycled by an automotive manufacturer with an all-electric testing machine. In the illustrated test, a rear engine mount for a truck engine is going through a series of four load cycles. It is compression-deflected three times at 3/16 in for conditioning the rubber, and then subjected to a 500-lb load the fourth time.

This cycle test is followed by a shear test in another position with three deflections of 0.5 in and then application of a 500-lb load. The specimen is strained and relieved at the rate of ⅛ in per min, which extends the time for both tests to about an hour.

A Baldwin SR-4 testing machine of 50,000-lb capacity accomplishes the cycling. Similar tests are conducted on rubber hose for the cooling system, brake, and power steering, as well as tests for metals and plastics.

Tank Trucker Buys Diesels

A new fleet of 45 diesel tractors has been purchased by Coastal Tank Lines, Inc., York, Pa. These consist of White Motor Co. 9000 TDs with 175-hp JT-6-B Cummins Turbodiesels. The company operates in 19 states and the District of Columbia.

R. L. Green, operations manager, stated: "We have found that because of the increased horsepower afforded by the Cummins Turbodiesels, and their roadability, the new Whites have reduced driving time in some cases as much as 40 minutes in a 6-hour run by maintaining a higher road average. This makes for more efficient operation and economy, even in the mountainous terrain of western Pennsylvania."

news of our industry

Alco to Increase Texas Plant

An expansion plan for its Beaumont, Tex. plant, amounting to over $1½ million, is in the works for Alco Products Inc. It will combine extension of warehouse as well as manufacturing facilities.

The new warehouse, to be completed in June, will be used for storage of parts for the company's new diesel-electric drilling rig package and auxiliary power and pipeline-pumping diesels. Expansion of the manufacturing area will include increases for production of heavy-duty heat transfer equipment along with oil-drilling and production items.

ASME Citation to Sidler

Paul R. Sidler, president of Brown Boveri Corp., has been awarded a special citation to commemorate his 12 years of service to the Gas Turbine Div. of the American Soc. of Mechanical Engineers. The presentation took place at the first national conference and exhibit sponsored by this group.

The citation honors Mr. Sidler for his contribution in the group's founding and his able chairmanship. It recalls his part in introducing the first Brown Boveri gas turbine to the U.S. some 20 years ago, his services as the division's first and principal contact for foreign developments, and his papers which made the new prime mover known among engineers. Brown Boveri's exhibit at the conference featured scale models of the two 25,000 kw gas turbines it installed in "the largest gas turbine power station in the world" at Livorno, Italy.

DEMA Educator Conference

A spring conference for engineering educators was recently held in Olean, N. Y. by the Diesel Engine Mfrs. Assn., co-sponsored by Clark Bros. Co. and Van der Horst Corp. The one-day seminar, devoted to engine design, manufacturing, and maintenance, was attended by 24 educators from 10 eastern institutes.

New

PLAN-GEAR TRANSMISSION

as simple to operate as an Electric Motor

• Here is AMERICAN GEAR'S new **PGT** transmission as used with a Chrysler engine to power a gasoline tractor. This new, hydraulically operated compound planetary transmission has been successfully used on earth movers, road rollers, tractor loaders and other equipment.

• Complete performance tests at one of the country's leading Institutes of Technology have verified **PGT's** outstanding performance. The report on these tests describes **PGT** as "offering a simple, versatile and extremely flexible means of power transmission...good efficiency ...conservatively rated."*

• **PGT** offers these important advantages over more complex transmissions...

- Easily operated by anyone by merely moving a single hydraulic control lever
- Practically instantaneous (1.5 seconds) change of speed or direction without shifting gears
- Only one control valve lever for all speeds and neutral
- Utterly smooth...no shock...no jerk... no noise
- Cushion shift prevents shock loading, eliminates trouble
- Eliminates operator fatigue by eliminating clutch pedal
- Hydraulic control lever placed convenient to operator without regard to location of transmission
- Planetary gearing means considerably less length for comparable loads and speeds
- Positive pressure-fed lubrication to bearings and gears
- Two power take-off apertures can transmit up to one-third of engine output maximum

*Complete report on request

Write today ***for this new 8-page booklet which gives complete information, design details on all 7 models of PGT transmissions***

7 DIFFERENT MODELS • 85 OR 150 TO 200 LB. FT. TORQUE
1 OR 2 SPEEDS FORWARD • CHOICE OF REVERSE RATIOS

USE PGT TRANSMISSION ON

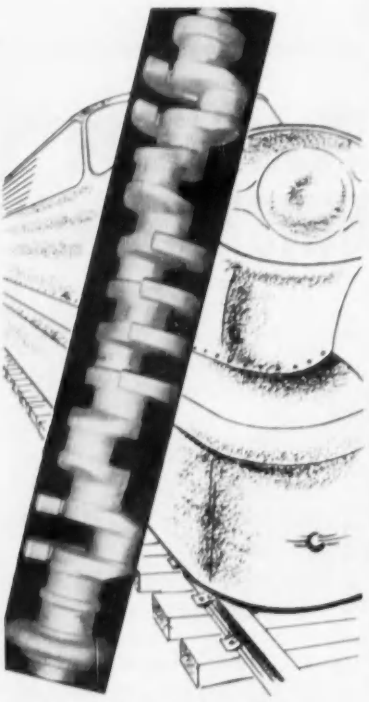
Lift trucks • Earth movers • Hoists and cranes • Car pullers • Slushers
Conveyors • Power take-offs • Front end loaders • Road rollers
Other industrial equipment • Truck mixers

Designed and built exclusively by

AMERICAN GEAR & MFG. CO.

New Avenue, Lemont, Illinois • Phone: Lemont 920

Subsidiary of BRAD FOOTE GEAR WORKS, INC., Cicero 50, Illinois



PARK "DIE-FORGED" CRANKSHAFTS

help power the trains of tomorrow

The new entries in the lightweight train race are designed to solve the problem of mounting deficits in passenger operation by cutting original, operating and maintenance costs.

Park Drop Forge is proud that Park "Die-Forged" Crankshafts are specified for the diesel engines that power these trains of tomorrow.

HEAVY DIE FORGINGS SINCE 1907

Diesel Crankshafts up to 4000 lbs.
Crankshafts and Connecting Rods
Aviation and Marine Drop Forgings

THE PARK DROP FORGE CO.
Cleveland 3, Ohio

news of our industry

Dieselize Steam Crane

Claimed to be the largest locomotive crane conversion on record is the changing over of a 250-ton relief crane from steam to diesel power, accomplished by The Boston & Maine Railroad. Installation was made through the use of an Industrial Brownhoist conversion package with a Caterpillar D337 diesel, developing 219 hp at 1800 rpm, as the power unit.

The relief crane is a self-propelled unit with mechanical drive, power transmitted through air-actuated clutches. This method is said to be more satisfactory than use of manual-type clutches since speed of operation is increased. To give the advantages of diesel plus torque characteristics inherent in steam power, the engine was equipped with a Twin Disc torque converter with a wide chain housing.

New Buda Distribution Setup

Allis-Chalmers Mfg. Co. has announced a change in dealership policy for the material handling equipment products of its Buda Div. Dealers for this equipment will now work through 12 factory branches and a Chicago district office, the branches to supervise sales and service and carry stocks of parts as well as new equipment.

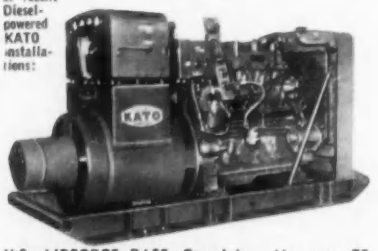
The new policy will mean closer contact in the field for both dealers and customers. It will also make available the facilities of the company's factory branch operations to each sales area. Factory branches will have material handling sales managers and factory-trained service managers to work directly with dealers.

Caterpillar Builds New Plant

Aurora, Ill. is the site of another plant now under construction by Caterpillar Tractor Co. for the production of D2 and D4 crawler tractors and two corresponding sizes of Traxcavators, or tractor shovels. Upon completion of the facility, the space made available at Peoria will be used to increase manufacturing capacity for D6, D7, D8, and D9 tractors and all diesel engine models.

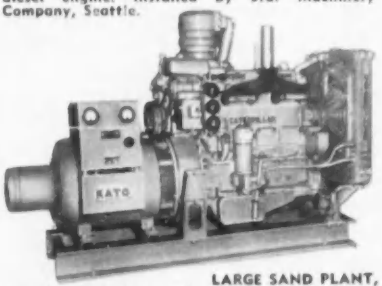
KATO
CONTINUOUS **A.C.** AND STANDBY
GENERATORS
ARE ADAPTABLE TO ALL MAKES OF ENGINES...
SIZES TO FIT ANY NEED UP TO 500 KVA

Three illustrations of recent Diesel-powered KATO installations:



U.S. AIRFORCE BASE, Grandview, Mo. uses 75-KW, 93.8 KVA, 120/240V., 60 cycle, single phase, 1800 RPM KATO Generator, driven by P & H Harnischfeger Model 487-18 diesel engine, for emergency lighting. Sold by AAA Engine & Electricity, Kansas City.

BOEING AIRPLANE CO., Seattle, Wash., purchased 175 KW, 219 KVA, 3 phase, 3 wire, 60 cycle, 1800 RPM, revolving field type KATO Generator, General Motors Model 62403-RA diesel engine. Installed by Star Machinery Company, Seattle.



LARGE SAND PLANT, operated by Barton Const. Co., uses Model 8SEPS4, 150 KW, 187 KVA, 220/440V., 3 phase, 60 cycle, 1800 RPM, 2 bearing, close coupled type KATO Generator adapted to No. 0 bell-housing on Caterpillar D337 diesel engine. Sold by Wm. H. Ziegler Co., Minneapolis.

WRITE
Builders of Fine Electrical Machinery Since 1928
KATO *Engineering Company*
1408 First Avenue, Mankato, Minnesota

news of our industry

Federal-Mogul Set to Merge

A plan to incorporate National Motor Bearing Co., Inc. into Federal-Mogul-Bower Bearings, Inc. has been submitted to shareholders of both outfits. If approval is won, it will mark the third time in three years that F-M has increased its size and scope of operations.

At the end of 1953 it acquired the Bearings Co. of America with its line of ball bearings. In 1955, Bower Roller Bearings Co. with its full line of straight and tapered roller bearings was taken in. The proposed merger will add an important line of non-competing oil seals.

GM Unveils Free Piston Engine

At the dedication of the new General Motors Technical Center, the XP-300, first automobile powered by the free piston engine, was shown to the public. It has been under test at the center for the past three years. The experimental power package has been designated the GM-10-10.

The engine has no crankshaft, connecting rods, nor rotating parts as on the conventional engine. Basically its pistons operate like a bellows, blowing hot gases through a pipe to a turbine. The spininng turbine powers the rear wheels of the motor car. It generates a nominal 250 hp and is described as a Siamese unit.

This description means that it consists of two parallel cylinders, each containing a set of two horizontally opposed pistons. It is a departure from previous free piston design used in Europe for large size jobs such as powering ships, locomotives, etc. These units usually are made up of a large single cylinder or banks of disconnected single cylinders each containing two pistons.

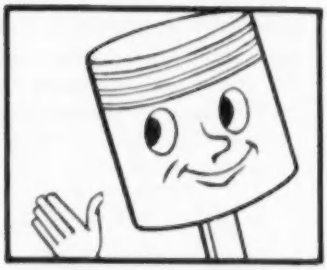
One feature of this type of engine is its capability of using any type of oil from high octane gasoline to residual fuels, as well as vegetable oils. It has few precision parts as compared with piston engines and gas turbines, to offer interesting possibilities for heavy-duty vehicles. Also, engineers say, it is inherently balanced so that it operates with virtually no vibration, and the comparative absence of parts causes little wear of rubbing metals.

The pistons of the GM-10-10 are arranged opposite one another in horizontal cylinders. An air-fuel charge fired between them, with injectors, drives the pistons apart so as to compress air at the ends of the cylinders. The compressed air bounces the pistons back toward inner dead center. As they travel inward, they also compress air that pumps into a diesel cylinder.

The back-and-forth movement continues to compress air which is piped to a turbine. These exhaust gases are relatively cool so that the turbine blades can be made of non-critical material.

In the experimental car, the unit is under the hood, the pipe to the turbine running under the car's side to give the passenger compartment a flat floor. In the rear compartment, the turbine is combined with the transmission-axle unit, transmitting power to the rear wheels.

CEMENT SHEATHS
guard gulf wells

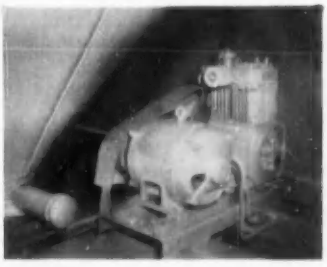


by Cecil Diesel
ROVING REPORTER

PORT OF NEW ORLEANS—"What kind of ship is *this?*" I ask Skipper as the twin 270 HP Caterpillar marine diesels settle down to work. (I see another pair of Caterpillars, D3-18's, there in the engine room teamed with 40 KW generators.)

"This is one of the fleet of seagoing Halliburton cementing ships," he says. "Our deck tanks are filled with cementing materials. We're headed for some offshore oil drilling rigs, where we'll protect well casings with sheaths of cement. Pump it down as a liquid with power from three Cummins NHRBS 600 diesels.

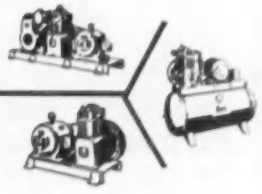
"For starting . . ." he goes on, "we've got two D-340 Quincy compressors — one forward, one in the engine room. Use them to operate cement discharge valves and air-over-hydraulic controls for the ship itself, too!"



Quincy has a compressor for your diesel starting job, too. Let them help you select the right model from a range of mountings and sizes — from 1 to 90 CFM. Write them for a catalog today.

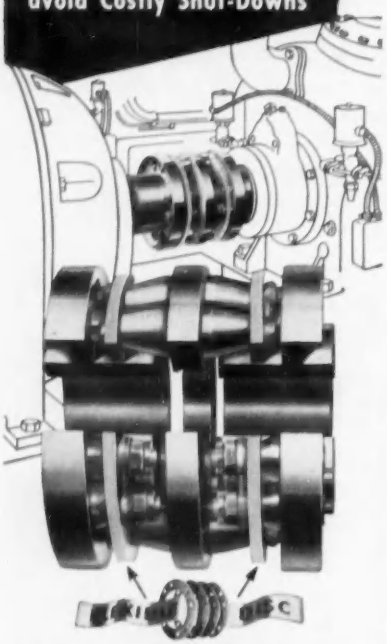
Quincy COMPRESSORS

QUINCY COMPRESSOR CO.
DEPT. J-49, QUINCY, ILLINOIS



World's finest air compressors.

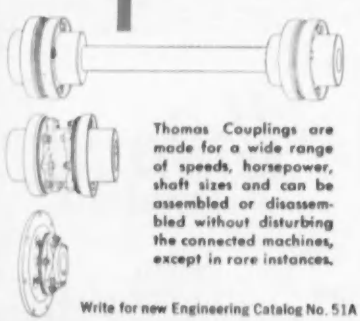
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

new products

Vane-Type Flowmeter

For air or gas flow, Scully-Jones & Co. has designed a vane-type flowmeter, No. 1050, to be used for indicating, controlling, signal alarm, safety shutoff, sequence starting, or shutdown. Operation of the instrument depends on flow rate.

As the vane rotates with increased flow, the area between the end of the vane and the flexible spline in the meter body increases. This increase approximates the law of squares for pointer stability and scale reading. By varying the weight of the vane and the area, various capacities are produced.

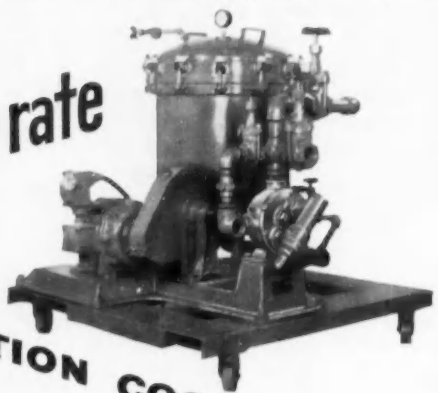
The area is shaped to give an evenly divided scale. Pointer movement on the dial is multiplied by gearing for easy reading at a distance. Simple adjustments allow for densities of different gases. The meter is said to be incapable of damage by overrange flow or overpressure.

Small Parts Cleaner

A new addition to its line of batch-type cleaning machines has been announced by Magnus Chemical Co., Inc. The Roll-O-Matic Metal Laundry, as it is called, automatically washes, rinses, rust-protects, and dries small metal parts and is claimed to eliminate hand scrubbing and air blow off.

Dirty parts are loaded in a revolving drum attached to an air cylinder, which is then lowered into a tank. The parts are rotated in a wash solution, spray rinsed, anti-rust treated, and then hot-air dried. The drum is automatically raised so that the unloading chute, which is attached to the drum, lowers. When the operator opens the drum door, the parts are dumped on the chute and slide into a pan.

HIGH Flow rate
LOW OPERATION COST



WITH VIKING PUMPS

Sparkler Manufacturing Company, Mundelein, Illinois, assures high quality performance, high flow rate, and low operation cost by including Viking pumps as original equipment on their horizontal plate filters for clarifying resinous coatings.

Filters range in capacity from 300, 500, 700, 1000, 1400, 1700, 2000 and 3000 gallons per hour, and Viking pumps are available in the sizes required to meet all of these capacities.

Vikings are adaptable to many pumping requirements—perhaps yours, too. For information, write for Bulletin 565d.

VIKING PUMP COMPANY
Cedar Falls, Iowa, U.S.A. In Canada, it's "ROTO-KING" pumps
See our catalog in Sweets

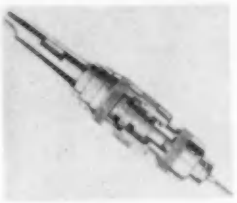
new products

Heavy-Duty Balancer

Bear Mfg. Co. is in production on a new balancing machine, the No. 3301, which handles both single and dual truck wheels, crankshafts, clutches, armatures, flywheels, impellers, and blower wheels. An all-purpose designation has been given to the unit since it is said to balance rotating parts weighing anywhere from 25 lb to 1000 lb and measuring up to 60-in diam.

New Tapping Head

Automatic torque control for a broad range of working conditions is claimed to be provided by an adjustable-clutch tapping head available from Davis Boring Tool Div., Giddings & Lewis Machine Tool Co. Called the Tap-Saver, it regulates driving torque according to the hardness of material and type and size of tap, by a simple dial setting.



The tool is said to be effective for drilling, reaming, spot facing, and counterboring, in addition to right or left hand tapping. A quick-change chuck permits tool changes for different operations, using special tap and drill collets which are part of the set. Also, a series of operations for the same hole can be done in sequence without repositioning the machine spindle or the work; only tool and collet are changed.

The material selector works by manual adjustment. A threaded sleeve is rotated until it advances to an indicator line to the particular metal. Once set, the tapping head and its collets automatically provide the correct driving torque for that material and for the tool to be used.

FOUR FREE OIL FILTRATION AND FILTER/SEPARATOR MANUALS ARE YOURS AT NO COST.

A wealth of information for Diesel engineer and operator.

1. **CORRELATION OF LABORATORY INSPECTION OF LUBE OIL WITH FIELD TESTS.**
   A combination of tests that can be done in the field and in the lab. A common-sense approach to the subject.
2. **WATER AND ABRASIVES REMOVAL FROM FUEL OIL OF SEA GOING VESSELS.**
   Shows new methods of 99.95% efficiency in smaller, more compact units.
3. **ABRASIVE REMOVAL TESTS ON LUBRICATING OIL FILTER ELEMENTS IN DIESEL LOCOMOTIVES.**
   A down-to-earth study for two major first-class railroads. Brimful of "on-the-road" data.
4. **MAINTENANCE IN SERVICE OF LUBRICATING OIL QUALITY BY FILTERING, CENTRIFUGING, RECLAMATION.**

THE BRIGGS FILTRATION COMPANY
WASHINGTON 16, D. C. DEPT. 110

YES. Send me manual numbers 1 2 3 4 (check one or all)

NAME .....
COMPANY .....
ADDRESS .....

Briggs
PIONEERS IN MODERN OIL FILTRATION

OIL FILTERS

New OAKITE HURRICLEAN STEAM GUN

removes heavy soil in half the time!

If you had designed this new "HURRICLEAN" Steam-Detergent Gun yourself – if you had planned it, part by part, to enable you to steam-clean more thoroughly, quickly, easily, at lower cost, you couldn't have suggested one practical advantage that isn't incorporated in the "HURRICLEAN" gun.

Check these big advantages:

- ✓ Works off plant steam supply – no tanks, pumps or injectors needed.
- ✓ No more burns – cold solution travels along outer tube. Keeps grip surface cool.
- ✓ No more hose twisting – to change direction of cleaning spray, merely turn rubber grip on its rotary joint.
- ✓ Lightweight – gun weighs only 6 1/4 pounds.

To get a close-up of this new gun in action, to see how easily it works, how safe it is, how well it cleans, see your nearby Oakite man for a *free*, practical demonstration. Send for illustrated brochure. Oakite Products, Inc., 22C Rector Street, New York 6, N. Y.

OAKITE

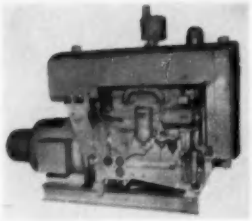
Export Division Cable Address: Oakite
Technical Service Representatives in Principal Cities of Canada

new products

Lightweight Generating Sets

Four-cycle diesel engines of 6 cyls power the new series of large-capacity generating plants being produced by Universal Motor Co. Turning at 1800 rpm, the new series is offered as a companion to the recently announced line of 1200 rpm generators.

The new models are in 8 through 35 kw sizes, furnished with a variety of controls to meet job requirements. Standard equipment includes 12-v



starting system with battery charging generator and ammeter; oil pressure gauge; muffler; radiator; fan; water pump; bypass thermostat; oil bath air cleaner; Bosch single-plunger injector; full pressure lubrication; and centrifugal-type governor.

Lightweight Electrode Holder

Aluminum forgings constitute the body and upper lever of an arc welding electrode holder announced by Tweco Products, Inc. Called the No. AL-300 Twecotong, it weighs 13½ oz for a claimed 50% reduction in weight compared to conventional holders made of copper castings. The forging of the metal parts is said to give high tensile strength as well as surpass the conductivity of copper castings.

Both lower and upper jaw of the tool are made of copper, cadmium-plated for corrosion resistance and to prevent stick of weld spatter. All parts of the holder are replaceable. The welding cable is attached by baring the cable end and inserting in the reamed hole of the holder body; one large ball-point allen screw holding the connection.

Graphite Spray

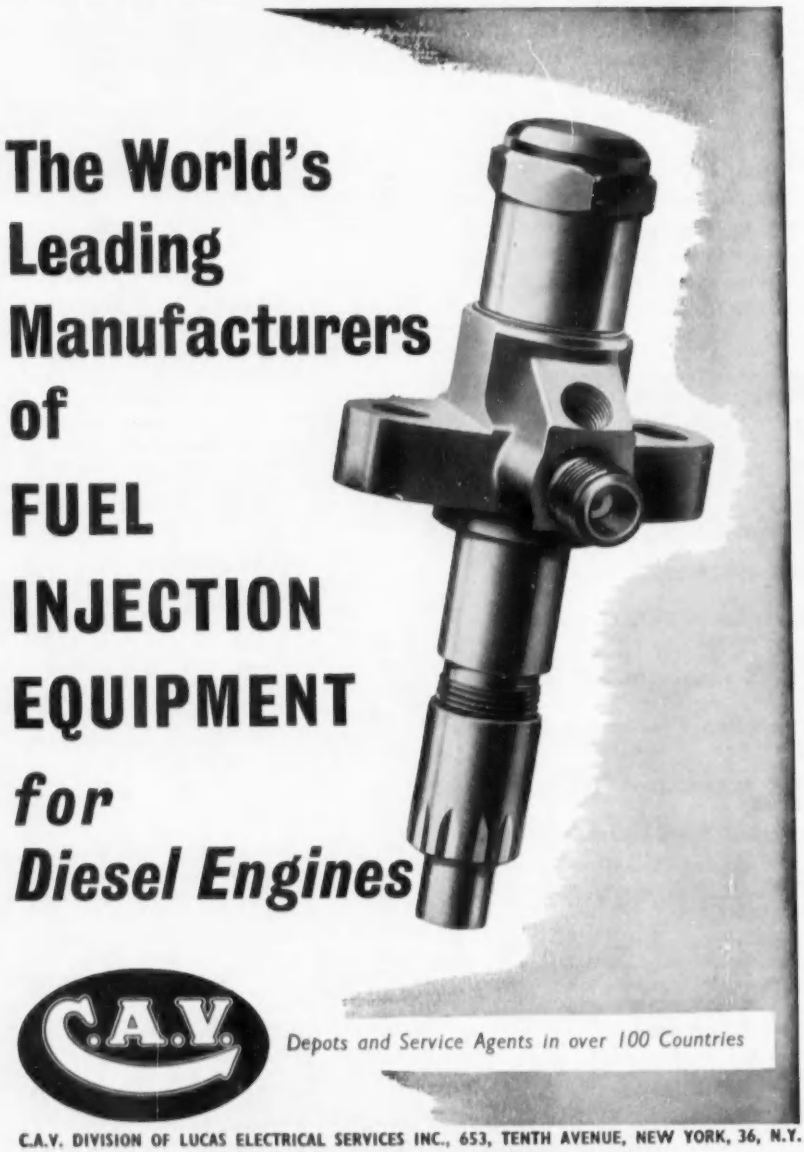
A graphite lubricant, called Spray Graph by its manufacturers, American Resin Corp., is available in 6-oz spray containers. For use on both metallic and non-metallic surfaces, it is said to provide effective lubrication at temperatures ranging from —100°F to 800°F.

Application is made, after the surface has been cleaned with a degreasing solvent. The material is claimed to be immediately impregnated and the surface coated with a long-lasting film.

Engine Starting Spray

Spray Starting Fluid Co. has announced development of a propellent to be used with its Spray starting fluid in the pressurized can. The spray itself is said to work effectively at temperatures as low as 65°F below zero and withstand 180°F of heat in storage.

The newly developed flammable propellent is claimed to work effectively at the same low temperature without impairing the efficiency of Spray and also remain inert for safety in storage. The original can will continue to be supplied with its separate atomizer, although the company expects the new method of dispensing to become the more popular type.


The World's Leading Manufacturers of FUEL INJECTION EQUIPMENT for Diesel Engines
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Depots and Service Agents in over 100 Countries
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Sales Office: 14820 DETROIT AVENUE, CLEVELAND, 7, OHIO.
AP174-754

new products

Railway Battery Cell Filler

Gould-National Batteries, Inc. is making a simple device for adding the exact amount of water to battery cells without overflushing and without reaching into the battery box if hinged vent caps are installed on the battery.

It is a lightweight tool called Rite-Hite cell filler which consists of a long tube to permit reaching into the battery box and a hydrostatic means of controlling the flow. The end of the tube is inserted in the cell opening so that water flows from the source through the tube until its end in the cell is submerged. Hydrostatic pressure cuts the flow off automatically when the electrolyte reaches the correct height as determined by the length of the nozzle on the end of the tube.

No current or electric light bulbs are needed. The only moving parts are a spring valve and diaphragm. Static line pressures above 20 psi and below 60 psi are necessary. For pressures above, a restrictor is required in the inlet. The cell filler can also be used to wash off the top of battery cells by operating the tool manually with a lever beneath the handle.

Rust-Preventive Spray

Packaged in a 12-oz aerosol spray container is a new compound known as Rust Chek which is designed to simplify the work of applying a preservative to metal tools and machinery. According to Eastern Aerosol Products, the manufacturer, one can provides approximately 80 sq ft of coverage in the form of a clear, dry, waxy film to a thickness of 0.0005 in.

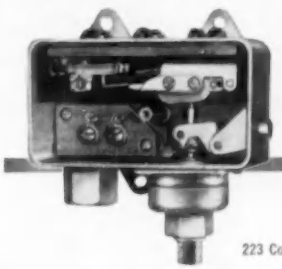
Except where critical tolerances are to be held, the film need not be removed when the protected item is removed from storage for use. The film is worked off in using and in some applications, it is declared, it serves as a lubricant. Submersion tests conducted in salt water, etc., to simulate atmospheric conditions, are said to have indicated that the product will provide complete and permanent protection during storage periods.

Small-Diameter Pipe Cutter

Model O is the designation of a portable flame cutting and pipe beveling machine for small-diam pipe (1½ to 4 in), introduced by H&M Pipe Beveling Machine Co. Perfect, square bevels are said to be produced under all conditions by unskilled operators. A specially designed boomer strap allows speeding up of the process of changing the machine from one piece of pipe to another.

Changing the unit is a matter of replacing precision-made adapters, identified for the various pipe sizes. Any plain-barrel machine cutting torch may be used in the cutting operation.

COMPACT DETROIT CONTROL PROTECTS YOUR DIESEL



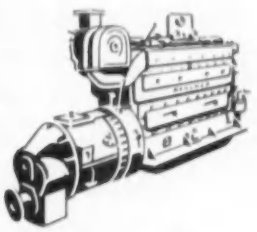
223 Control, cover removed

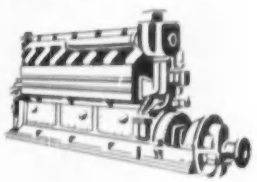
Detroit 223 Control has wide application in lube oil pressure and temperature alarm systems. It is also used as an automatic engine control switch for emergency shutdown and in other critical functions. This rugged control is only 4 1⁵⁄₁₆" x 4⅝" x 2¾" and weighs 2½ pounds. The 223 Control is water tight and not affected by conditions of high temperature and high humidity.

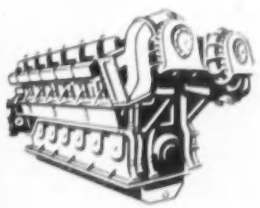
This automatic switch is actuated by either pressure or temperature. It can control several circuits, it can actuate a program of safety circuits or it can govern one circuit alone.

Marine, locomotive and stationary diesel engines, pumps, oil drilling engines, mobile compressors and dynamos are only a few applications where Detroit 223 Control safeguards valuable engines and machinery.

Bulletin 257 will be forwarded at your request.







Detroit Controls supplies a wide variety of dependable automatic controls for industry.

DETROIT CONTROLS CORPORATION

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Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation

AUTOMATIC CONTROLS for INDUSTRIAL USES
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Representatives in Principal Cities
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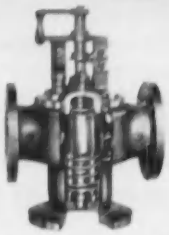
FULTON SYLPHON ENGINE CONTROLS

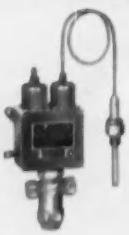
fit the engine and the danger



No. 1280. (No. 1281 similar, but no manual operator)

PREVENTS INEFFICIENT OPERATION
All-in-one control. Holds cooling water or lubricating oil at constant temperature. Unaffected by pressure changes.

Any engine's safer with a Fulton Sylphon safety control or temperature regulator. Because of the wide variety, you can always find the one best for your purpose. And the "heart" of each and every one is the Fulton Sylphon seamless metal bellows—unmatched for accurate, trouble-free performance.



No. 530

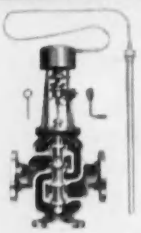
STOPS ENGINE
Safety control shuts off fuel if water temperature goes above or lube pressure goes below safe point. Fail-safe.

No. 953-E

POSITIVE PROTECTION
Operates in conjunction with No. 530 to stop gas or dual-fuel engines. Shuts off gas supply and vents fuel system.

No. 539

4-WAY SAFETY
If water temperature or lube pressure exceeds limit, No. 539 operates alarm, light or pilot, or stops engine.



No. 923-3WB

BIG ENGINE CONTROLLER
Holds jacket water or lube oil at desired temperature. Special 3-way valve maintains constant volume of water.

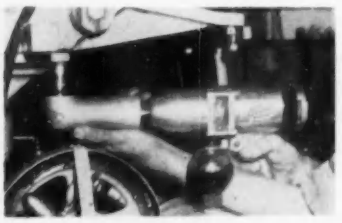
FULL DETAILS GIVEN IN BULLETIN No. 817-ND
Write for your copy

Mr. Controls®

Robertshaw-Fulton CONTROLS COMPANY

FULTON SYLPHON DIVISION • Knoxville 1, Tennessee

new products



Impact Wrench Attachment

For air- and electric-driven impact wrenches, a right-angle attachment, No. 568, is being produced by Thor Power Tool Co. Designed for comparatively inaccessible locations, the attachment will fit any ½-in sq drive impact wrench. It features a 29/32-in spindle offset front, right and left, is less than 6-in long, and has a head height of 2⅜ in. Weight is 2½ lb.

Magnetic Level

Built-in, permanent magnets are the features of a new level placed on the market by Richards Merchandizing, Inc. They serve to hold the level securely on ferrous metals at any angle on flat or curved surfaces, thereby freeing the worker's hands. An easily-read dial gives angle graduations.

The company states that the level is particularly helpful in overhead or cramped-quarter work. It is made of aluminum, weighs 10 oz, and measures ¾ in by 1⅞ in by 9 in. Made to withstand hard use, the instrument is claimed to be unharmed by shock or vibration.

Alkaline Rust Remover

Turco Products, Inc. announces that it has developed an alkaline material for the removal of rust, paint, and primer, in one dip and rinse operation. The powdered compound is said to remove light rust in less than a minute, heavy rust and multiple paint layers in usually a few minutes.

The product is used in a mild steel hot tank of welded construction, followed by a pressure rinse. The de-rusted metals are said to be no more subject to rusting than are new metals.

What Do You Know!

(*Answers to Questions on Page 59*)

1. Correct answer is "a". Although the *specific* fuel consumption of a turbocharged engine is lower than that of the non-turbocharged engine, the total gallons used is higher because a greater number of horsepower-hours are produced in the same time interval. See page 42.

2. Correct answer is "b". Turbochargers are principally sensitive to engine load. The higher the load, the more fuel is burned and the greater the exhaust energy. Then the turbine turns faster. See Page 42.

3. Correct answer is "a". Better scavenging lowers cylinder temperatures and additional air smooths out combustion. See Page 42.

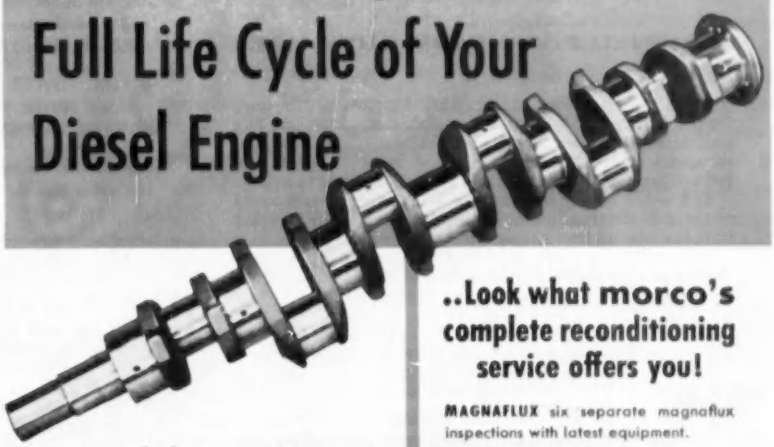
4. Correct answer is "a". Solvents have a tendency to form sludge which interferes with hydraulic governor operation. Governor manufacturers recommend that operating oil be used for flushing purposes. See article on Page 61.

5. Correct answer is "c". At low loads the air/fuel mixture may be so lean that it does not ignite. To compensate, either the intake air is modulated or some other special method is used to guarantee ignition. See article on Page 50.

6. Correct answer is "a". In early gas engines air/fuel mixture was enriched to insure ignition at all times regardless of load. This limited compression ratios and thermal efficiency since when the mixture reached its critical compression ratio it would detonate. See Page 50.

7. Correct answer is "a". Fuel characteristics such as cetane, for example, affect engine starting but not engine operation at higher loads. At high loads fuels with low cetane number can be used. This applies to other fuel properties as well. These fuels with poorer properties naturally cost less. See Page 50.

morco Factory-Certified Exchange Crankshafts give Trouble-Free Operation for the Full Life Cycle of Your Diesel Engine



morco dealers—coast to coast—are stocked with reconditioned, like-new crankshafts for different diesel engine models. Users of Detroit Diesel and Cummins engines can exchange worn shafts for MORCO factory-reconditioned shafts through authorized dealers.

Why take chances? Let your dealer be your source for dependable, safe crankshaft regrinding. You get immediate service, guaranteed quality and terrific economy. Ask your dealer about MORCO today.

..Look what morco's complete reconditioning service offers you!

MAGNAFLUX six separate magnaflux inspections with latest equipment.

GROUND on production type equipment to engine manufacturers' specifications. Original stroke retained.

TOCCO* HARDENED by the original equipment method when necessary.

ROLLED FILLETS increase strength at the most critical areas.

DYNAMIC BALANCE restored on original factory balancing equipment.

THRUST COLLARS and surfaces restored.

GEAR FITS renewed.

KEY WAYS restored.

DOWEL HOLES repaired.

OIL SEAL surfaces renewed.

THREADS repaired.

*TOCCO is a registered trademark of the Ohio Crankshaft Co.

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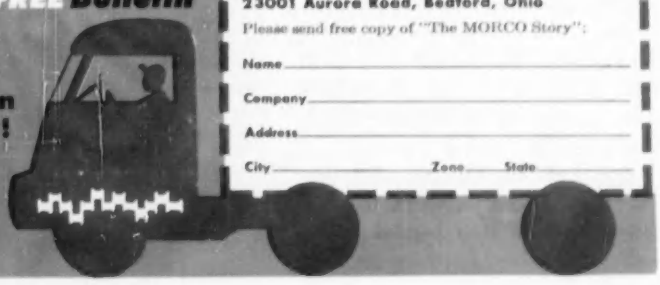

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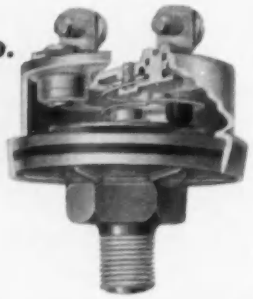
ROCHESTER
MANUFACTURING CO.
PRODUCING NEW

PRESSURE SWITCH



DESIGNED FOR HEAVY DUTY USES

The new rugged and dependable RMC #2900 Series Pressure Switch is designed for service on vibrating equipment. The mechanism is sealed dust-proof and watertight. The diaphragm is Buna N impregnated and is calibrated at the factory to close or open a contact at fixed pressure values.

This switch is used to signal low lube or fuel oil pressures; to energize electrical circuits when the diesel starts by tying in to the lube oil line, among other applications.

Designed for 6, 12 or 24 volts DC, but available for low voltage AC. Double or single terminal, ⅜" or ¼" center back connection. Send for sample for inspection and test.

HAS RUGGED COUNTERPART
IN NEW RMC SERIES 2908
VACUUM SWITCH

"Rely on Rochester"

RMC
ROCHESTER MANUFACTURING CO.

141 ROCKWOOD STREET • ROCHESTER 10, N.Y.

DIESEL POWER HAS

100 JOB OPENINGS

If you want to become a member of DIESEL POWER'S organization . . . if you're interested in earning *hundreds of extra dollars* for just a few spare-time hours . . . then YOU may qualify for one of the 100 lucrative openings as a DIESEL POWER subscription agent.

***You've 1,000,000 subscription sales prospects*—ALL owners and operators of diesel powered equipment; diesel sales and service personnel; research engineers and designers, etc. who do NOT now read DIESEL POWER.**

DIESEL POWER will supply ALL MATERIAL you'll need to take orders. YOU merely write the orders—AND KEEP 50% *OF THE SUBSCRIPTION FEE.*

For further information and sales material, just fill out the form below.

DIESEL POWER,
81 Lincoln Avenue, Stamford, Conn.

I wish to become a DIESEL POWER subscription agent, and to receive a 50% *commission on every new subscription I sell.* Send me the necessary information and sales material.

NAME .....

ADDRESS .....

CITY ..... **ZONE** ..... **STATE** .....

Important: Your Company's Field of Business .....

new products

Bondable Teflon

The problem of adhering Teflon to itself or other materials is said to have been overcome to a large extent by a newly developed "Bondable Teflon". Flexrock Co. is now surface-treating Teflon sheets and tapes so that permanent bond can be achieved with conventional commercial adhesives. Good strengths are claimed for aluminum, mild steel and wood.

Tube-Bundle Heat Exchanger

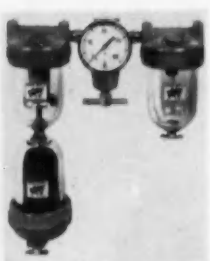
Built for extensive application in the heating and cooling of liquids is a fixed-bundle-type heat exchanger, newest product of Yates-American Machine Co. The bundle is fixed by bonding the tubes to the flanged baffle plate of the heat exchanger. This is said to eliminate vibration wear.

Each baffle has been flanged to provide a solid base on which the tube rests; the tube then bonded to the baffle for rigidity. Furthermore, each baffle plate is beveled around its perimeter so that when it is inserted in the heat exchanger shell, it is said to fit tightly and securely to provide a leak-tight seal. In addition, every tube joint is rolled for tight connection. Single-pass, two-pass, and four-pass designs are available in standard sizes.

Air Control Assembly

Filtration, lubrication, and regulation are claimed to be automatically provided by a new air control assembly manufactured by Airmatic Valve, Inc. The assembly is for compressed air used in operation of pneumatic equipment.

The 3-stage operation provides for automatic entrapment of sludge formed of dirt, scale, rust, and moisture. A drain trap attached to the bottom of the filter collects moisture to eliminate periodic draining maintenance. After the cleansed air is regulated to the desired pressure, a fine oil mist is added by the lubricator, which oil is then carried to the operating parts of the air-operated equipment.



Steam Cleaner

Eleven different portable or stationary models, with choice of electric-motor or gasoline-engine drive are available in the newest Hypressure Jenny Steam Cleaner line of Homestead Valve Mfg. Co. Known as the "Twelve Fifty" series, the new Jennys deliver a minimum of 120 gph "at any pressure."

All models include 25 ft of hose, 10 ft drop cord, one insulated cleaning gun with round nozzle, and one each 2-in and 4-in flat nozzles. Deluxe models have remote control starting and stopping, control panel, and hose rack. All standards are stationary, plug in to start, and have fuel and solution shutoff valves only.

new products

Heat-Resistant Paint

An aluminum-silicone paint "that refuses to burn off even under blasting heat" has been developed by Atech, Inc. Called Alumicone, it is reported to withstand temperatures in excess of 1500°F.

Although initially developed for aircraft application, it is claimed to be practical as well for diesel mufflers, automotive engines, and exhaust systems. For use wherever high temperatures deteriorate normal paint, it is said to require no special primer or involved equipment. It can be sprayed or brushed directly on the metal.

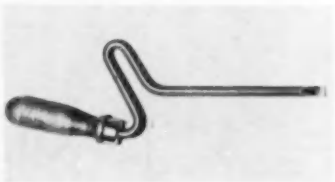
Log Handler Has Power Shift

A rubber-tired logger featuring a heavy-duty torque converter, power shift transmission, and planetary wheel drive and steer axles, is the latest production development of the Construction Machinery Div. of Clark Equipment Co. Called the Model 175, it lifts 20,000 lb at 0 mph and is rated 14,000 lb at 4 mph. The machine's top speed is 27 mph.

The diesel 6-cyl version is rated 133 hp with a 426-cu in piston displacement. Driving controls consist of two finger-tip levers on the steering column, one for high-low, the other for forward-reverse. A 6-ft diam log can be handled by two hydraulically operated log clamps which can be raised to 11 ft, 7 in.

Fast-Action Screw Driver

A new type of screw driver, featuring a swivel handle and a U-bend in the shaft so that it can be manipulated with a twist of the wrist, is being marketed by Mayville Mfg. Co. Named Tru-driver, the tool is said to provide both speed and power. It has a guaranteed no-slip tip and is available for either slot or recessed-head screws.

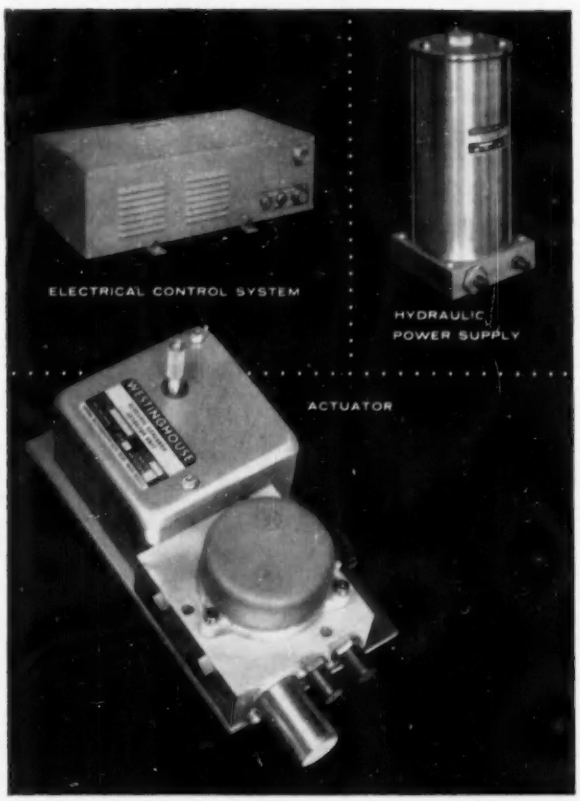


Noise Analyzer

To aid in the fight against a troublesome safety problem, industrial noise, Mine Safety Appliances Co. has introduced the Soundscope. It serves as a meter to measure overall sound levels and as an analyzer to measure sound in each of eight octave bands.

When used as a sound level meter, the instrument picks up noise through its microphone to transform the sound into electrical energy. The meter reading is calibrated in decibels. Range is from 24 (that of a very quiet home) to 150 (higher than an air-raid siren).

In the analyzer section, noise is filtered into any of the eight octave bands, from 75 to 19,200 cycles per second. Noise peaks in each of these bands can then be measured individually. Continuously variable filters are used for finer analysis by frequencies within the octave bands. This is important since investigations show that the ear is more susceptible to some frequencies than to others. Thus, technicians can accurately determine the offending frequencies.



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new literature

Powder Metallurgy Techniques
used in structural parts of machinery, which could up to now only be made through expensive casting and machining operations, are discussed in a pamphlet offered by American Society for Testing Materials. It represents a lecture given by F. V. Lenel at the 1955 meeting of the organization, and sells for $1.50 per copy.

For Fuel Delivery Equipment
Clifford B. Hannay & Son, Inc. has prepared a 28-page catalog listing its complete line of hose reels, giving sizes, hose capacities, and reel variations.

Safety Controls
and accessories developed by Amot Controls Corp., to provide for complete hydraulic control systems for engines, are fully detailed in a catalog just produced by the company.

Under the Shovel
that's the title of a 16-min sound color film produced by Euclid Div. of GM. It shows the job application and product feature of the Model UD, a 10-ton rear dump, the smallest Euclid manufactures.

Drills and Reamers
with carbide tips for use in hardened steel are the topics of a folder from Chicago-LaTrobe. The company's complete line is discribed.

A 14-Page Index
is now available to the pamphlet edition of its rules of practices and procedures, the Federal Power Commission announces. It's free.

Cutting Truck Service Costs
is the subject of a 32-page study released by Ingersoll-Rand. Time and cost comparisons are offered for hand and air and electric power tools to allow a shop to evaluate its present service equipment. Common operations are studied.

Simplified Welding Procedures
for every base metal sums up the information contained in a 140-page pocket data book now available free from Eutectic Welding Alloys Corp. Covered are 120 welding rods, electrodes, and welding compounds.

Dust Collectors
of various types and sizes for every application are considered in a 16-page catalog, offering of Torit Mfg. Co.

Extending Aluminum Piston
service life as much as five times through use of piston groove inserts made of Ni-Resist austenic iron, is explained in "Keep Them Rolling", a folder produced by International Nickel Co., Inc.

Men, Machines and Materials
at De Laval Steam Turbine Co., a 48-page illustrated book, is being made available by the company. It contains a history of the development of the 55-yr-old company as well as a round-up of facilities, products, and repair services.

All-Purpose Comparator Gauges
for use in gauging external dimensions of parts having a variety of sizes and shapes, are described in Bulletin 200, offered by Metron Instrument Co.

Type FMP Compressor
the newest in Cooper-Bessemer's line, has been fully detailed in an engineering catalog available on request. It is built for field pickup service, gas boosting, air drilling, and general industrial use.

Heat-Resistant Paints
capable of withstanding up to 1400°F without significant deterioration or loss of protective properties, are described in a research report by the Army Corps of Engineers, just released through the OTS. The paints are needed for such high temperature atmospheres as mufflers and manifolds.

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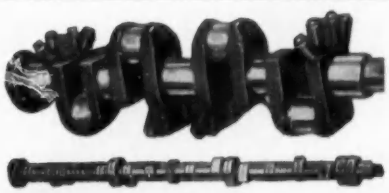

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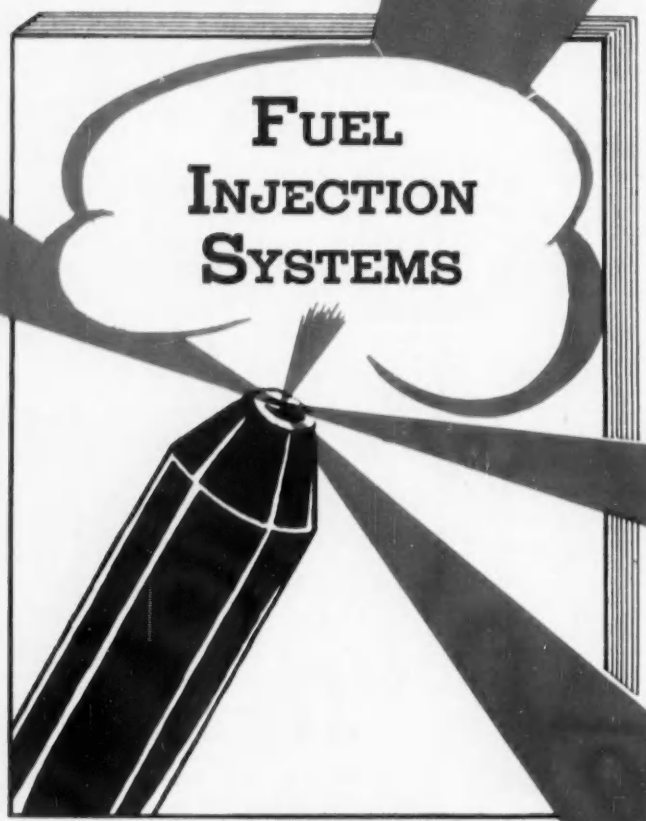

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organizational news

Three New Officers

have been elected by the board of directors of Fairbanks, Morse & Co. Robert H. Morse, III, formerly sales manager, is now vice president-sales. D. L. Harwood has been moved up from his post of general purchasing agent to vice president-purchases. Former chief product engineer, J. F. Weiffenbach is now director of engineering.

R. H. Morse, III

D. L. Harwood

J. F. Weiffenbach

Executives Named

to new positions at Caterpillar Tractor Co. are Lloyd J. Ely, William L. Naumann, and Clifford N. Hathway. Their respective positions are now director of manufacturing, Peoria plant manager, and Joliet plant manager.

Assistant Chief Engineer

is now the title of Joseph R. Anderson at DeLuxe Products Corp. He's been with the LaPorte, Ind. company for 20 years in various filter production and engineering capacities.

Appointed Sales Manager

for the New York offices of Erie Forge & Steel Corp., William J. Vonah leaves a similar post with Camden Forge Co.

W. J. Vonah

Director of Merchandising

a newly-created post at Minneapolis-Moline Co., has gone to Bon D. Grussing, recently manager of advertising. John Ruskino succeeds him at his former post, and William W. Lundell has been named director of public relations.

Public Relations

for Westinghouse Electric Corp. in New York will now be managed by William C. Parker. He succeeds Charles P. Johnson who is resigning to form his own public relations outfit.

Two Specialists

with backgrounds in heavy equipment have joined R. G. LeTourneau, Inc. Rodney A. Kox has been appointed to head sales activities of off-road transporters and cross-country freighters. Thomas W. Miller will head sales of the company's growing line of logging products.

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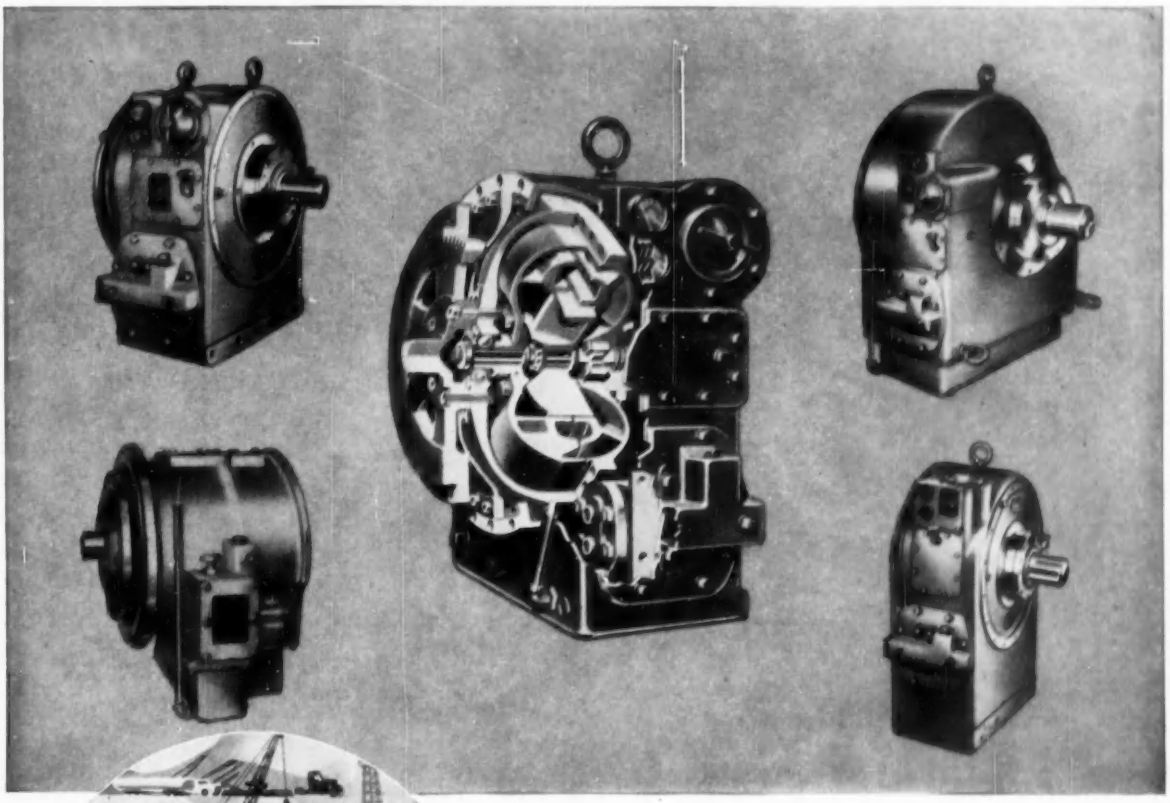

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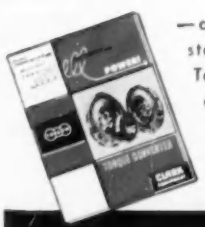

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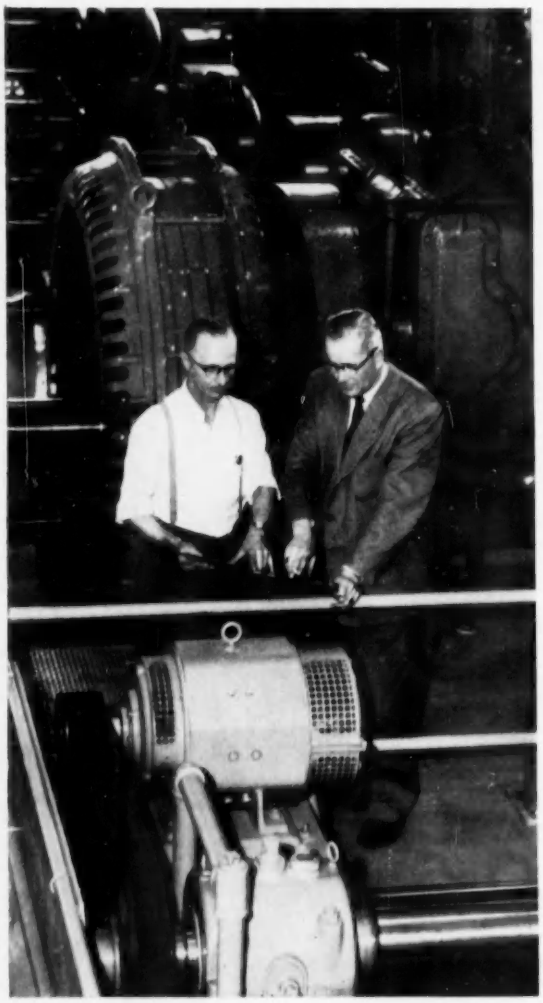
Report on Cumberland, Wisconsin, Municipal Utility's experience with diesel lubricants.



Clarence Maxcy (left), Chief Engineer at Cumberland, and Standard Oil lubrication specialist Ralph Rowlands check efficiency records of utility's engines lubricated with STANODIESEL Oil M. Providing technical service on lubrication problems is something for which Ralph Rowlands is well qualified. He has been doing this sort of work with Standard for 13 years. Ralph attended the University of Wisconsin and is a graduate of the Standard Oil Sales Engineering School.

Management of Cumberland, Wisconsin, Municipal Utility found a way to extend time between ring changes, to get greater fuel efficiency and to cut cylinder wear. How? By using STANODIESEL Oil M.

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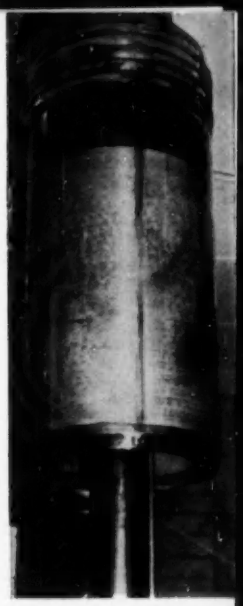
(Indiana)



Piston from engine using STANODIESEL Oil M photographed just as it was pulled for 7,800 hour overhaul. Piston is clean and in excellent condition.

STANDARD

Quick Facts About
STANODIESEL Oil M

- **Is refined from highest quality base stock. Has superior stability.**
- **Contains special additives that:**
  - **Inhibit oxidation, control unwanted increases in oil viscosity.**
  - **Keep crankcase, pistons, cylinder walls and other parts clean.**
  - **Keep contaminants in suspension, prevent them from depositing.**
  - **Control foam, make oil suitable for use in hydraulic governors.**
  - **Increase the oil's ability to reach and maintain a film on highly stressed parts.**